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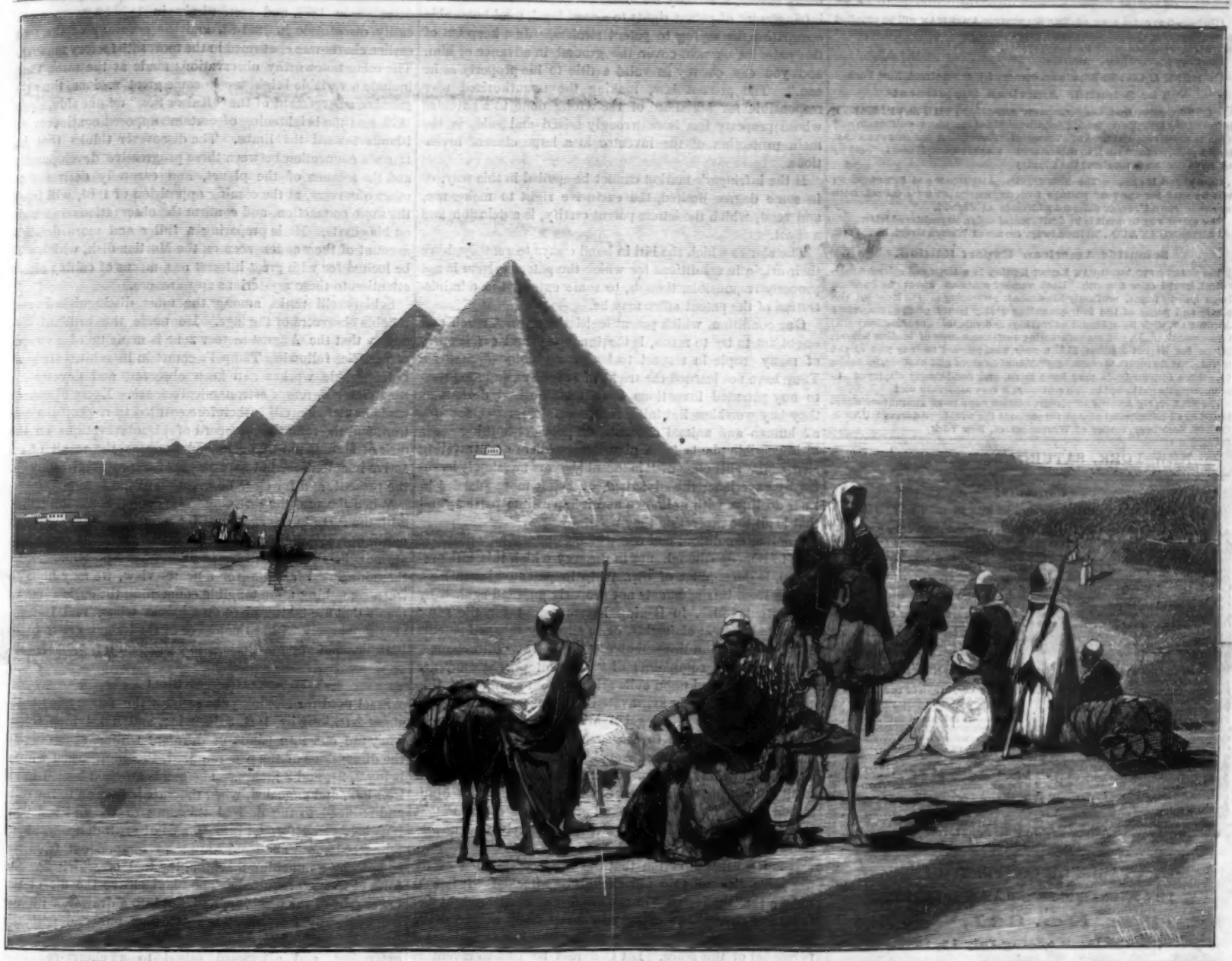

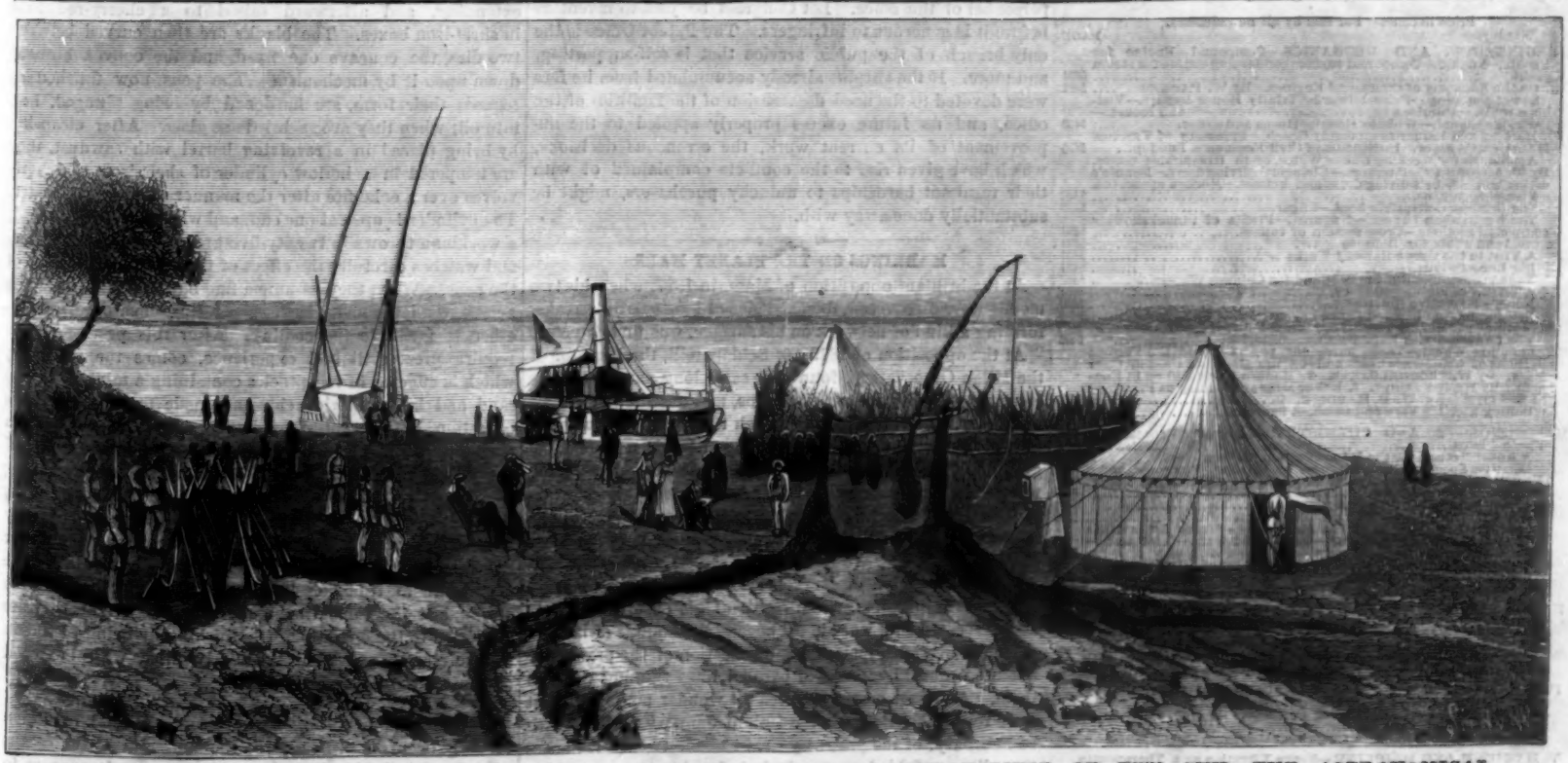

THE RIVER NILE AND THE GREAT PYRAMID OF EGYPT.—THE RECENT ECLIPSE OF THE SUN.—THE ASTRONOMICAL STATION ON THE NILE.

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INNOCENT PURCHASERS IN THE SENATE.

The House bill to exempt from responsibility the purchasers of patented inventions "in good faith and in open market," regardless of the vender's right to sell, has been carried to the Senate. Its fate there should not be doubtful.

However willing a portion of our rural population may be to try to cure an avoidable evil affecting themselves, by introducing a vastly greater evil the burden of which shall fall irretrievably upon patentees, and however desirable it may seem to certain politicians to win their favor by granting their demands, there is, or should be, in the Senate too much practical good sense to suffer the wrong to be done. The abuses which the farmers complain of are vexatious, no doubt, but it is not to be believed that the country is ready to seek a remedy for them in a law which raises the infringement of patent rights to a semi-legal, semi-honorable occupation, by saying to patent stealers, "Just keep out of the patentee's reach, cover the ground in advance of him, and you can convey as valid a title to his property as he can." The present law, making the unauthorized user responsible for his share of the wrong done to a patentee whose property has been wrongly seized and sold, is the main protection of the inventor in a large class of inventions.

If the infringer's market cannot be spoiled in this way, or in some degree limited, the exclusive right to make, use, and vend, which the letters patent certify, is a delusion and a cheat.

The abuses which the bill in hand essays to remedy, have their origin in conditions for which the patent system is not properly responsible, though, to some extent, the administration of the patent office may be.

One condition, which patent legislation cannot reach and ought not to try to reach, is the ignorance and carelessness of many people in respect to legitimate business practices. They have not learned the tricks of swindlers, and are prone to buy patented inventions from unauthorized dealers, as they buy worthless lightning rods, worthless "specifics" for all human and animal ailments, or good-for-nothing seeds of impossible plants from plausible peddlers and traveling sharpers. This class of "innocent" buyers are slowly learning by experience the advantage of being more guarded in their dealings with unknown and irresponsible parties; and that is all the protection they need.

Another condition, and one which Congress may properly seek to remedy (though not in the way which this bill proposes), is the conflict of ownership in patented inventions, arising from infringements not properly guarded against by the Patent Office, in issuing letters patent for the same device to different claimants, or in allowing reissued patents to cover more than the patentee is justly entitled to claim.

So far as the complaints of "innocent purchasers" are just they are based upon evils arising from conflicts of this nature, too frequently aggravated by erroneous decisions of the courts touching the legal rights of the contestants. So long as men are liable to err, such conflicts, with their attendant evils, are to be expected. They cannot be wholly prevented in this sphere of property interest any more than in all others; but their frequency may be materially diminished by so improving the administration of the Patent Office that wrongly issued patents—relatively few now—shall be still fewer.

It is from this direction that the evils complained of by the advocates of this bill should be attacked. It is well known that the increase in the number of cases brought before the Patent Office every year has largely exceeded the proportionate additions made to the working facilities and personnel of the office. Let Congress be just to inventors before it is generous to infringers. The Patent Office is the only branch of the public service that is self-supporting, and more. If the surplus already accumulated from its fees were devoted to the needed extension of the facilities of the office, and its future excess properly applied to the improvement of its current work, the erroneous decisions, which have given rise to the conflicts complained of with their resultant hardships to unlucky purchasers, might be substantially done away with.

MARKINGS ON THE PLANET MARS.

At the brilliant opposition of Mars, in 1877, when his two moons were discovered, the existence of long narrow streaks, forming a kind of network on his surface, was first detected.

At the opposition of 1879–80, Schiaparelli, the Director of the Milan Observatory, found the same long narrow streaks crossing the disk in all directions, and resembling canals more than anything else with which terrestrial observers are familiar. He made careful drawings of this unique topographical feature, for he knew that a discovery disagreeing with commonly accepted ideas, unless thoroughly substantiated, would not be acceptable to those astronomers who have firm faith in the physical resemblance between Mars and the earth.

At the opposition of Mars in 1881–82, Schiaparelli again attacked the problem. The result of his observations was as unexpected as it was almost beyond the bounds of belief.

He discovered a remarkable duplication of the previously observed canals by means of parallel lines running through them. And now comes the greatest wonder among all that were revealed. Between the 19th of January and the 24th of February, of the present year, in about twenty instances these lines unfolded progressively before his eyes, stretching out in similar and parallel lines through the canals, and thus duplicating their number.

Nothing but entire confidence in the great ability and experience of the observer will enable us to accept the truth of so startling an assertion. We have faith in the canals and their duplication, but that an observer many million miles away should see lines actually lengthening, pushing their way along with mathematical precision, seems to be something beyond the power of the human vision to penetrate.

The keen-eyed astronomer saw other things on the Martian disk as well as the progressive development of the parallel lines in the so-called canals. Though the opposition of Mars in 1881-82 was under unfavorable conditions, his atmosphere was clearer than it was in 1877. The Professor did not fail to improve the propitious occasion for strengthening the evidence of previous discoveries as well as for making important additions to them. The markings detected in 1877, and seen dimly in 1879-80, were more easily discernible in 1881-82, and the accuracy of the two earlier charts was confirmed in the most satisfactory manner. The other noteworthy observations made at the same time include a variable brightness in some great regions, the progressive enlargement of the "Kaiser Sea" on one side, since 1879, and the brightening of certain supposed continents or islands toward the limbs. The discoverer thinks that he traces a connection between these progressive developments and the seasons of the planet, and earnestly desires that other observers, at the coming opposition of 1884, will trace the same connection, and confirm the observations recorded on his charts. He is preparing a fuller and more detailed account of the wonders seen on the Martian disk, which will be looked for with great interest as a means of calling closer attention to these mysterious appearances.

Schiaparelli ranks among the most distinguished and reliable observers of the age. He made the brilliant discovery that the August meteor zone is made up of a swarm of particles following Tempel's comet in its orbit. He is an indefatigable worker and keen observer, and devotes his life to the progress of astronomical science. Every discovery made by Schiaparelli is therefore entitled to respectful attention, and the remarkable record of his observations on the disk of Mars is not to be looked upon as the result of an active imagination, but as a theme for profound study in the present, and for close observation in the future.

When the sun, the earth, and Mars come again into line, with the earth in the center, at the next opposition of Mars on the 31st of January, 1884, some of the great telescopes that are now being built will be in successful operation. With these increased facilities for a nearer view, we may hope to learn something more tangible concerning the curious movements that are taking place on a planet whose real features are more nearly within the power of the human eye to grasp than those of any member of the solar family.

Manufacture of Steel Pens.

Steel used for making pens reaches the factory in sheets about 2 ft. long by 1 ft. 3 in. wide, and 0 004 inch thick. They are cut into bands of different widths, according to the dimensions of the pen required, the most usual widths being 2, 2½, and 3 inches. The bands are then heated in an iron box, and annealed, when they are passed on to the rolls and reduced to the desired thickness of the finished pen, thus being transformed into ribbons of great delicacy, about four feet long. The blanks are then stamped out from the ribbons by a punching machine, the tool of which has the form of the pen required. The blanks leave the die at the lower part of the machine, and fall into a drawer, with the points already formed. They are then punched with the small hole, which terminates the slit, and prevents it from extending, and afterward raised to a cherry-red heat in sheet-iron boxes. The blanks are then curved between two dies, the concave one fixed, and the convex brought down upon it by mechanism The pens, now finished as regards their form, are hardened by being plunged, hot, into oil, when they are as brittle as glass. After cleansing by being placed in a revolving barrel with sawdust, they are tempered in a hollow cylinder of sheet-iron, which revolves over a coke fire after the manner of a coffee-roaster. The cylinder is open at one end, and while it is being turned, a workman throws in twenty-five gross of pens at a time and watches carefully the effect of the heat on the color of the pens. When they assume a fine blue tint, he pours the pens into a large metal basin, separating them one from another, to facilitate the cooling. After this process, which requires great skill and experience, comes the polishing, which is effected in receptacles containing a mixture of fine sand and hydrochloric acid, and made to revolve. This operation lasts twenty-four hours, and gives the pens a steel-gray tint. The end of the pen, between the hole and the point, is then ground with an emery wheel revolving very rapidly. There only now remains to split the pens, which is the most important operation, being performed by a kind of shears. The lower blade is fixed, and the upper one comes down, with a rapid motion, slightly below the edge of the fixed blade. To give perfect smoothness to the slit, and at the same time make the pens bright, they are subjected to the operation of burnishing by being placed in a revolving barrel almost entirely filled with boxwood sawdust.—*Chronique Industrielle.*

EXPLOSION OF CARBON BISULPHIDE.—A fatal explosion recently occurred at Bradford, England, due to the escape of carbon bisulphide into the public sewer. It appears to have come from a grease works where it had been used in the extraction of oil from seeds.

AMERICAN CROCODILES.

It is not generally known that in the less frequented parts of Florida we have a crocodile, and it is only within a few years that the discovery has been made, a single specimen attesting the fact in the collection of reptiles at the Smithsonian Institution. Probably seen before, but confounded with the alligators, as in Jamaica and South America, they are quite rare, and have never been captured until the fortunate find above mentioned.

Mr. Monroe informs me that during the past winter he had unusual opportunities of observing their habits, etc., and that to their resemblance to the alligator they owe their preservation. The great point of difference he found was, that the crocodiles lived in salt water bayous or creeks near the sea, while the alligators affected only the fresh water streams. Mr. Monroe's party observed some exceedingly large crocodiles at Key Biscayune—one the majority of the party claimed to be twenty feet in length; Mr. Monroe, however, thought it at least sixteen feet long. An attempt will be made to capture this one next winter, in the interest of science. The Indians are well acquainted with the crocodiles, and distinguish them as the "long-nosed alligators."

The crocodile, cayman, gavial, and alligator, are all types of the well known group (Crocodilia), and have some peculiarities that distinguish them at once from other reptiles. The heart resembles that of the birds more than that of any cold-blooded animals, in having the ventricle completely divided by a septum into two chambers; the venous and arterial blood joins outside of the heart; the brain is birdlike, the cerebellum broader; and naturalists divide them into two general orders: the true crocodiles and the alligators—the points of distinction being extremely conspicuous, especially in the shape of the head; the muzzle of the crocodile is much narrower behind the nostrils, that of the alligator being in a straight line. There are other anatomical differences needless to mention.

One of the largest of the order is the Gavial or Gangetic crocodile (*Gavialis gangeticus*), often reaching a length of twenty-five or thirty feet, and presenting a strange appearance with its attenuated muzzle, that, however, contains one hundred and twenty teeth.

The Nile crocodile (*Crocodilus vulgaris*) is nearly as large, and is now rarely seen in the lower Nile, if we except its mummies, which are extremely common in all the excavations.

Another species (*Crocodilus porosus*) is found in India, and easily recognized by the two long ridges extending from the front of the eye over the upper jaw. The Marsh crocodile (*Crocodilus palustris*) exceeds in size the Nile species, and in the British Museum there is a head of this species twenty-six inches in length, showing that the animal must have been thirty-three feet long. This species also occurs in Australia.

In Southern Africa is also found the margined crocodile (*Crocodilus marginatus*), that differs from the North African species by a curious concavity of the forehead and its stronger dorsal plate.

The Florida crocodile is the *Crocodilus acutus* of Cuvier, identical with the Jamaica species, but entirely different from the cayman of Guiana, South America. The Smithsonian specimen is a young one. Cobbold avers that the color of the adult is blackish brown above and yellowish white beneath; the upper parts of the legs and the sides varied with deep yellow, and in some parts tinged with green; in the younger ones the color on the upper parts is a mixture of brown and pale yellow, the under parts being nearly white. The eyes are provided with a nictitating membrane, or transparent movable pellicle, as in birds; the mouth is of a vast width, the *rictus* or gape having a somewhat flexuous outline, and both jaws being furnished with very numerous sharp-pointed teeth, of which those about the middle part of each jaw considerably exceed the rest in size, and seem analogous to the canine teeth in viviparous quadrupeds or mammalia. The tongue is attached by its entire marginal circumference to the lower jaw, and is not extensile, as in all true lizards; the ears are externally closed by two fleshy slips; the nostrils form a long narrow channel, which only open anteriorly at the back of the throat; and under the throat there are two small pouches, which secrete a strong musky substance. The tail is long, powerful, of a laterally compressed form, and furnished above with an upright process, formed by the gradual approximation of two elevated crests proceeding from the lower part of the back; it accordingly serves as the principal means of propelling the body through the water when in pursuit of fish. The legs are very short, but strong and muscular; the hind feet have only four toes, which are united toward their base by a strong web; the two interior toes on each of the fore-feet, and the interior one on the hin feet, are destitute of claws.

Prof. Hill carefully examined a specimen of *Crocodilus acutus*, caught by him at Jamaica, and says: "On opening the jaws the attention is taken by the sight of a conspicuous cartilaginous plate before the gullet, forming a ridge from one side of the fauces to the other, and expanding upward to meet a similar elastic fold depending from the back of the palate. These are valves that shut in the throat. We are led to conclude, on first seeing these valves, that we are examining an animal that has no tongue, and that the underfold of what we are inspecting is the rudimentary trace of that animal cut out. This, however, with the corresponding curtain above it, in the roof of the mouth, forms an apparatus that closes the distending aperture of the throat, and permits the reptile to hold its prey and drown it, without being itself liable to be drowned.

Between the branches of the lower jaw a certain degree of muscularity is perceived in the yellow flooring of the mouth. This is the representative of the tongue. The thickened membrane shows its lingual analogue, though destitute of all approach to a red color, by its rough glands and pores giving out saliva. The nostrils, placed at the extremity of the snout, terminate in a post-oral cavity, by passages that communicate with the throat behind the valvular apparatus we have been describing. This is a provision for respiration when the valves are closed, which at once renders intelligible and necessary a remarkable structure of the fauces by which the upper jaw seems to move upward, while the under one retains its horizontal position. The lower is prolonged behind the skull to a great depth. On raising the head at an angle the upper jaw appears to move upward, and the under jaw to remain immovable. The upper jaw does indeed move upward, but not independently. On casting back the head, an acetabulum of the united skull and jaw acts on a condyle of the lower maxillary bone, and lifts the whole head like the covered lid of a caddy; by this mechanism, the crocodile, on elevating its nostrils just barely out of the water, is able to breathe. With the body and head sunk below the surface, it keeps the under jaw pressed upward, and holds fast its drowning victim, its own breathing all the while being carried on with ease. The mouth is open, but the throat is shut, the gular valve being closed against all access of either air or water."

One of the interesting characteristics of the American crocodile is the care that it takes of its offspring; during the breeding season especially, the reptiles utter loud cries or shrieks that have been compared to the yelping of hounds or puppies. After the eggs have been buried by the female she frequently visits the nest, and when the young are about coming out she has been seen to move about the nest in clumsy tenderness, scratching and pawing the shells and uttering a curious barklike sound, that seems to excite the half hatched young to renewed exertions to extricate themselves from the broken eggs. This accomplished, she leads them away from the river to the marshy pools, safe from predatory visits of the male.

If hunted at this time they exhibit the utmost ferocity, and show great cunning in guiding their young to impenetrable swamps and places of safety. The young, who are unable to hunt for themselves, are fed by the mother, as are many of the young sea birds, by masticated food, disgorged for the purpose.

The movements of the crocodile on land, when in danger, are, according to Humboldt, Hill, and Gosse, totally different from those of the alligator, whose clumsy gait is familiar to all. They stand with their bodies off the ground, erect upon their legs, and make their attacks by successive jumps. That this method of attack is efficacious is shown by the experience of a priest, as related by Mr. Hill:

"The large savanna rivers in Spanish Hayti flow through wide but gently descending borders, carpeted with grass, and interspersed with thickets and clumps of flowering shrubs and forest trees. The grass has all the clean verdure of a lawn, and the clumps the variety and arrangement of ornamental shrubberies, and the earth is deep and loamy. These are favorite sporting grounds. Beside being verdant and beautiful, they are notoriously the game country. My friend and his companions had divided themselves, trusting to the crack of their fowling pieces to ascertain each other's whereabouts. When they had finished their day's sport the descending sun was already struggling through the lengthening shadows on the river. The friends assembled where they had parted in the morning, but the Spanish priest had not yet come in. No one had heard his gun from the time they had separated. They sought him through the darkening thickets, and along the stream, and found him at last, fast seated in a tree into which he had been obliged to betake himself to escape a crocodile that had pursued him by a succession of leaps. It had run in pursuit of him, as he said, jumping rapidly after him, with its back crooked like a frightened cat. He had sprung to the branches and gained their security out of the reach of the reptile, who, for a long time after he had got into the tree, couched in a thicket close by, where it quietly watched and waited his descent from his retreat."

The rapid growth of alligators, even in confinement, has often been watched with wonder, yet it would seem that the crocodile increases even at a more rapid rate, nearly a foot a year.

When Moreau de St. Mery, in 1790, collected materials for his work on San Domingo, he noticed a cayman that had been kept for ten years on a plantation at Gonaïves, not far from the Estir, called Cocherel. When it was first taken, it was only eighteen inches long; but at the time he wrote it had grown to the dimensions of seven feet. This may serve to give one some idea of the progressive growth of this reptile. He mentions that it was kept in a sort of inclosure into which no other water than that which the rain supplied was received; and rain does not commonly fall out of the season at Gonaïves. It was fed on the dead animals of the plantation and on sheep's entrails, but the people frequently neglected it; and it did not seem that in these intervals it got any food whatever, yet it steadily continued its growth. This notice of the penned-up reptile of Cocherel is most interesting for the fact of its living deprived of water.

There has been much controversy as to the manner of eating among these animals, and various opinions are held. Some consider that they take their food under water, devouring it only after it is putrid. General McChrystie, however, observed a species capture fish, toss them in the air, and catch them again, after the manner of the pelican. In the stomachs of Jamaica crocodiles, stones and marine crabs in great numbers were found, the former evidently taken in to aid digestion.

Great stress has been laid upon the fondness of the reptiles for dogs, and it has been found that a yelping puppy rarely failed to attract them, while the sportsman shot them from concealment. Hill, however, gives a different explanation to this: he thinks that owing to the similarity of the sounds, the females rush to the spot thinking their young are in danger, while the males are attracted by the hope of a feast upon their tender offspring. Waterton, the eminent naturalist and observer, has made the most extended observations upon the habits of the South American crocodiles. They were fished for by wire hooks formed of four pieces of hard wood a foot long, barbed at both ends; to these was affixed an animal of some kind, and with rope attached the bait was held over the river or pond, and if once taken, the struggles of the creature only served to hook it the more firmly. Waterton was probably the first to ride a cayman, and the following is his account of a capture novel in the extreme: "I placed all the people at the end of the rope, and ordered them to pull till the cayman appeared on the surface of the water; and then, should he plunge, to slacken the rope and let him go again into the deep. I now took the mast of the canoe in my hand (the sail being tied around the mast), and sank down upon one knee, about four yards from the water's edge, determining to thrust it down his throat, in case he gave me an opportunity; I certainly felt somewhat uncomfortable in this situation, and I thought of Cerberus on the other side of the Styx ferry. The people pulled the cayman to the surface; he plunged furiously as soon as he arrived in these upper regions, and immediately went below again on their slackening the rope. I saw enough not to fall in love at first sight. I now told them we would run all risks, and have him on land immediately. They pulled again, and out he came—'*monstrum, horrendum, informe.*' This was an interesting moment. I kept my position firmly, with my eye fixed steadfast on him.

"By this time the cayman was within two yards of me. I saw he was in a state of fear and perturbation; I instantly dropped the mast, sprang up, and jumped on his back, turning half round as I vaulted, so that I gained my seat with my face in a right position. I immediately seized his fore legs, and, by main force, twisted them on his back, thus they served me for a bridle. He now seemed to have recovered from his surprise, and probably fancying himself in hostile company, he began to plunge furiously, and lashed the sand with his long and powerful tail. I was out of reach of the strokes of it by being near his head. He continued to plunge and strike, and made my seat very uncomfortable. It must have been a fine sight for an unoccupied spectator. The people roared out in triumph, and were so vociferous that it was some time before they heard me tell them to pull me and my beast of burden further inland. I was apprehensive the rope might break, and then there would have been every chance of going down to the regions under water with the cayman. The people now dragged us above forty yards on the sand; it was the first and last time I was ever on a cayman's back.

"After repeated attempts to regain his liberty, the cayman gave in and became tranquil through exhaustion. I now managed to tie up his jaws, and firmly secured his fore feet in the position I had held them. We had now another severe struggle for superiority, but he was soon overcome and again remained quiet. While some of the people were pressing upon his head and shoulders, I threw myself on his tail, and by keeping it down in the sand prevented him from kicking up another dust. He was finally conveyed to the canoe, and then to the place where we had suspended our hammocks. There I cut his throat, and, after breakfast was over, commenced the dissection."

The crocodile of the American continent is far from being as savage as those of the Old World, yet numbers of instances are known where their attacks have resulted in the loss of life.

Prairie Dog Skins for Gloves.

In a recent communication Mr. Courtney Graham, of Colorado City, Texas, suggests that some enterprising tanner undertake the preparation of prairie dog skins for glove leather. The animals are exceedingly abundant in those parts, as they are almost everywhere on the plains and further west. In many places they are a serious nuisance, the grass of the cattle ranges being eaten up by them, and the ground honeycombed with their holes. They might be caught in large numbers, and would be caught by boys and others, if a market were made for their pelts.

It would be interesting to know if any attempt has been made to tan the skins of these animals or to use their hair or fur in the arts. The small size of the "dogs"—really rodents, like woodchucks and ground squirrels—would seem to be the chief bar to the profitable handling of their pelts.

THE search for pearls in the mussels of Ohio has been a considerable industry for years.

Insects on the Surface of Oranges.

When a dish of oranges is seen on the table for dessert, the fact is hardly realized that in all probability their surface is the habitat of an insect of the *Coccus* family. This tiny creature is found on the orange skin in every stage of transformation, from the egg to the perfect insect, during the winter months, instead of remaining dormant in the cold weather, as is the case with most of the insect tribe. It would hardly be possible to find a St. Michael's or Tangerine orange that had not hundreds of these little creatures in various stages of development on their surface. Lemons, too, are frequently covered. Upon inspection, the skin of an orange will be found to be dotted over with brownish scarlet spots of various sizes. These specks can be easily removed by a needle; and when placed under a microscope, an interesting scene is presented, consisting of a large number of eggs, which are oval white bodies, standing on end, like little bags of flour, some of the inhabitants of which may very probably be seen in process of emerging from the opened end of the egg. The female insect upon leaving the egg has six legs, two long hair-like appendages, and no wings; it thrusts a sucker into the orange in order to obtain nourishment, and never moves again, passing through the various stages of development until it lays its eggs and dies. In the case of the male insect, the chrysalis after a short period opens and the insect flies off. The male is supplied with wings twice the length of its body, and each of the legs has a hook-like projection. It has four eyes and two antennæ, and is so tiny that it cannot be seen when flying.

From some parts of Spain, oranges come to us having their rind covered with a *coccus* of quite a different type. The surface of oranges, indeed, affords the possessor of a microscope an infinite amount of interest and amusement.—*Chambers' Journal.*

NEW FERTILIZER DISTRIBUTER.

It is said that "the manure pile is the farmer's bank." It is certain that upon it depend his crops and his success in farming. No farmer has manure enough; he can always find use for more than he has. It is therefore of first necessity that he shall employ it to the best advantage and get all the good there is in it.

The best authorities agree in saying that the more thoroughly manure is comminuted and the more evenly it is distributed over the entire surface of the soil, the more effective will it be in producing a rapid growth and a large crop. And it is certain that the more thoroughly the manure and soil are intermingled the greater will be the economy in the use of manure.

We give an engraving of the Kemp manure spreader, a machine that effects the thorough distribution of fertilizers. It is made by the Kemp & Burpee Manufacturing Company, of Syracuse, N. Y. The working parts of this machine are mounted on a substantial cart, capable of containing thirty bushels, or about one-third of a cord, and can be attached to the fore wheels of any ordinary farm wagon. The floor of the cart is a revolving apron, which is carried backward by the gearing, bringing its contents against a rapidly revolving beater, which breaks up the manure finely and distributes it.

It is thrown into gear by a single lever at the left hand of the driver's seat, and throws itself out of gear when the load is spent. In running to and from the field none of the machinery is in motion, and it may be used the season through the same as an ordinary cart, and it needs no special adjustment for different kinds of work. It will thoroughly and evenly spread all kinds of manure found on the farm, from the coarsest down to the finest, including ashes and lime, in all conditions, wet or dry. The time required to spread a load is from one and a half to two minutes, without manual labor.

It can be regulated to spread different quantities of manure to the acre. The farmer may know just how much manure he is using without the trouble of measuring his field and his manure pile. We are informed that the spreader has been in use for three seasons, and there are now a large number of them in the hands of the best farmers in the country, who speak of it in the highest terms.

KEMP'S FERTILIZER DISTRIBUTER.

Definition of "Innocent Purchasers."

"Innocent purchasers," literally translated, signifies willfully ignorant purchasers. People who purchase from irresponsible parties, or from total strangers, have no right to complain if they are victimized, and as a general thing it is only the class who expect to make two dollars' worth from an investment of fifty cents who are victimized. The man who, in playing a "skin game," comes out "peeled," is not entitled to protection; he accepts his chances and should abide by the result.—*Milling World.*

ONE THOUSAND CARS ORDERED.—The Indianapolis Car Works have commenced on the contract to build 1,000 cars for the New York, Chicago & St. Louis road. The car is 30 feet long, and has a carrying capacity of 40,000 pounds.

NOVEL BOOT SUPPORTER.

One of the boots shown in the annexed engraving has Reed's recently patented supporter applied to it; the other is of ordinary make, and both have been subjected to the same wear under the same conditions, with vastly different results, as will be seen by the engraving.

The improvement consists in a finely tempered and very flexible spring wire inserted in a pocket formed by a double seam or welt in the sides of the boot leg. These welts may be either inside or outside of the leg.

The steel springs, while they allow perfect freedom of motion of the leg and ankle, keep the boot leg from wrinkling down and prevent the counter from running over.

This improvement adds very little to the expense of the boot, while it greatly increases its value to the consumer. It may be applied to either fine or coarse boots, and will increase their durability. It gives ease and comfort to the wearer and prevent galled feet and ankles.

REED'S BOOT SUPPORTER.

Further information may be obtained by addressing Messrs. Reed & Simons, Williamston, Mich.

Vibrations Produced by Railway Trains.

Prof. H. M. Paul has communicated to the Seismological Society of Japan some notes on the effect of railway trains in transmitting vibrations through the ground. A box holding about twenty pounds of mercury, thickened by amalgamation with tin, was placed upon a heavy plank screwed to the top of a post sunk 4½ feet into the ground. Images reflected in the surface of the mercury were observed by a telescope, as in meridian observations. An express train, passing at a distance of one-third of a mile, set the surface of the mercury in confused vibration for two or three minutes. Other observations were made at stations at somewhat greater distances. The experimenter also found that a one-horse vehicle passing along a graveled road 400 or 500 feet distant caused a temporary agitation of the mercury whenever the wheels struck a small stone.

TREATMENT OF PNEUMONIA BY THE INHALATION OF ETHER.—Dr. Samuel W. Francis, Newport, R. I., reports the successful treatment of an acute case of pneumonia by the inhalation of sulphuric ether. He says that "if seen early, during the first stage, by inhaling ether for thirty minutes, every six hours, many severe and protracted cases of sickness would be arrested." Dr. Francis recommended inhalation of sulphuric ether for bronchitis in 1868.

Cochineal.

Cochineal, as found in trade, is the dried body of the female cochineal insect, which lives on a species of cactus. During life it is about the size of a small ladybug. It is rather long, compressed, equally broad all over, wingless, and marked behind with deep incisions and wrinkles. The cochineal insect has six feet, which nevertheless are only of use directly after birth. It fastens itself upon the plant by means of a trunk placed between the forefeet, and remains there till it dies. The sap of the plant provides this little animal with nourishment. The male cochineal insects resemble the female only during the larva state. They change into the chrysalis, and soon come forth as small red flies. The female then lays some thousands of eggs, and becomes covered with a white powder. She protects the eggs under her body, and hatches them, so to speak, in this way. When the young insect appears the mother dies. The young are now in the larva state, and the sex cannot be discerned. They lose their skin several times, and the female then fixes herself on the plant. The males, after passing through the pupa state, are winged. Their whole period of life is from two to three months. The cochineal insects are gathered shortly before they lay eggs, and they are then very rich in coloring matter. Only sufficient eggs are laid as may serve to reproduce the insect. The dead females are also collected. They are killed with hot water or steam, and dried in the sun, in ovens, or on plates. They have a brown, red, white, or black color, and lose in the drying two-thirds of their weight. After drying the cochineal is sieved. About 70,000 insects go to make a pound of cochineal.

The Medicinal Value of Vegetables.

A celebrated cook book discusses the medicinal value of vegetables, as follows:

"Asparagus is a strong diuretic, and forms part of the cure for rheumatic patients at such health resorts as Aix-les-Bains. Sorrel is cooling, and forms the staple of that *soupe aux herbes* which a French lady will order for herself after a long and tiring journey. Carrots, as containing a quantity of sugar, are avoided by some people, while others complain of them as indigestible. With regard to the latter accusation, it may be remarked, in passing, that it is the yellow core of the carrot that is difficult of digestion—the outer, a red layer, is tender enough. In Savoy, the peasants have recourse to an infusion of carrots as a specific for jaundice.

"The large, sweet onion is very rich in those alkaline elements which counteract the poison of rheumatic gout. If slowly stewed in weak broth, and eaten with a little Nepaul pepper, it will be found to be an admirable article of diet for patients of studious and sedentary habits. The stalks of cauliflower have the same sort of value, only too often the stalk of a cauliflower is so ill-boiled and unpalatable that few persons would thank you for proposing to them to make part of their meal consist of so uninviting an article. Turnips, in the same way, are often thought to be indigestible, and better suited for cows and sheep than for delicate people; but here the fault lies with the cook quite as much as with the root. The cook boils the turnip badly, and then pours some butter over it, and the eater of such a dish is sure to be the worst for it. Try a better way. What shall be said about our lettuces? The plant has a slight narcotic action, of which a French old woman, like a French doctor, well knows the value, and when properly cooked it is really very easy of digestion."—*Medical Record.*

Sound Boots.

Viscount Cranbrook recently narrated a telling anecdote when distributing some science prizes to workingmen. He begged the medalists and prize winners not to be puffed up with their own importance because they had answered certain questions in chemistry and physics without a mistake. It was most gratifying to know that they, as hardworking handicraftsmen, were well grounded in science; but, for all that, they were not yet chemists. An old cobbler of the Viscount's acquaintance was exceedingly proficient in the subjects taught at science classes; he knew pretty well every star in the heavens by name, his knowledge of inorganic chemistry was profound, and he was one of the best draughtsmen in the village. But, after all, his great pride was to make a sound pair of boots.

Large Lathes

The South Boston Iron Works have nearly completed for their own use two 90-foot lathes, which are thought to be the largest and heaviest lathes in the world.

The lathes are made in six sections of 30 feet each. The head stocks and face plates weigh 10 tons each, and each bed section 10 tons. The completed lathes will each contain 600,000 pounds of iron. They are built specially for boring out cannon, but are adapted for all heavy work.

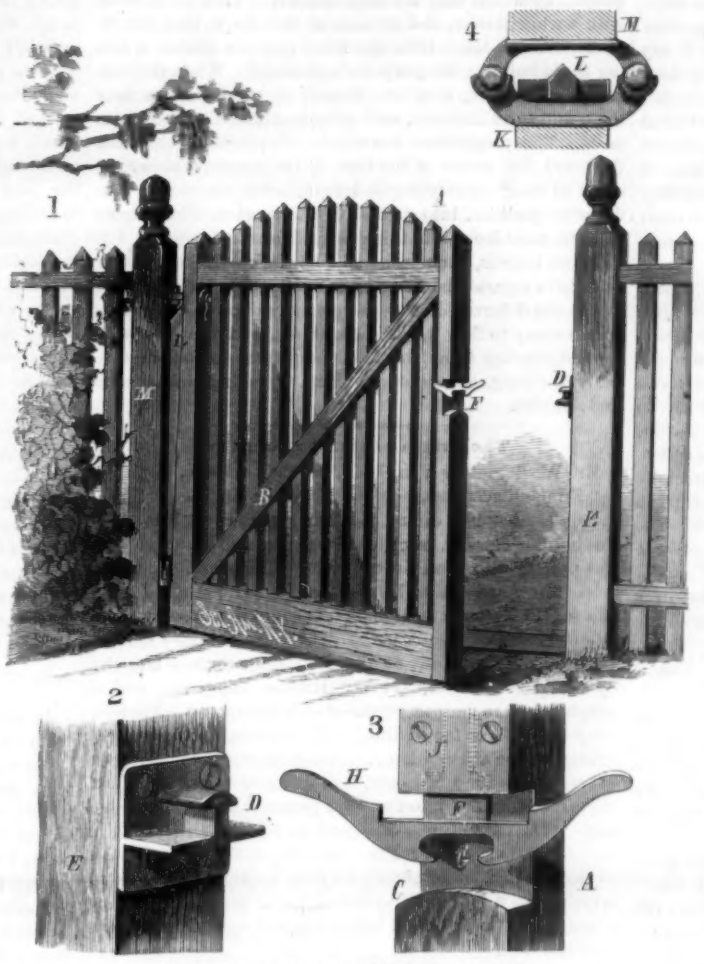
IMPROVED GATE.

The annexed engraving shows an improved gate recently patented by Mr. W. H. Marshall, of Oxford, Miss. This gate is intended to resist the various causes which tend to throw it out of adjustment, so that the latch will always work properly no matter if the distance between the gate and latch post varies or if the gate or posts get out of position.

The stile, A, at the swinging end of the gate, is recessed to receive the catch, D, projecting from the gate post, E. The catch, D, consists of a vertical plate provided with a horizontal flange upon which there is a T-headed rib for receiving the latch, F, at the upper side of the recess in the stile, A. This latch slides vertically in a guide, J, attached to the stile, and has a curved recess, G, for receiving the head of the catch, D. The latch, F, has inclined arms, H (Fig. 3), which are engaged by the catch, D, as the gate is closed, and raise the latch so as to bring its recess, G, on the head of the catch. The latch is formed so as to engage the T-head of the catch when an attempt is made by hogs or cattle to open the gate, so as to prevent the gate from being raised and thrown off the hinges. The hinge stile of the gate is tapered from bottom to top, and to it is secured a tapering filling piece, L, that fills the space between the stile and the hinge post, M, and prevents the passage of chickens and other small animals.

The shank of the upper hinge extends through the tapering stile, and is provided with a wing nut by means of which the shank may be drawn in or let out to compensate for any sag in the gate or inclination of the post. The construction of the lower hinge is clearly shown in Fig. 4.

These improvements seem to avoid the troublesome features of ordinary gates and render the gate always operative.



MARSHALL'S IMPROVED GATE

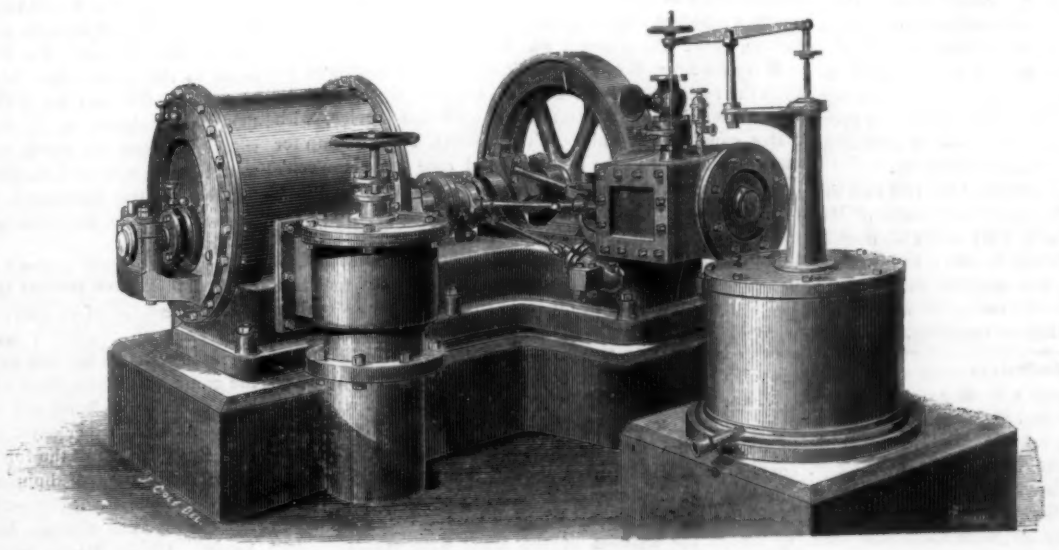
The Teeth of the Yakuts.

The *Herald* correspondent with the party in search of the lost crew of the Jeannette finds among the natives of northern Siberia the "most beautiful teeth in all the wide world." He says:

"Three hundred versts from Yakutsk I have seen old men of sixty and seventy with sets of teeth small and pearly white and polished and healthy as those of the handsomest American girl of sixteen. Decay and suffering and unsightliness and loss are actually unknown. A physician of Yakutsk tells me that he believes the reason of this phenomenon is to be found in the habits and the kind of food eaten by the natives, as well as to a certain care taken by them from childhood up. In the first place, the Yakuts do not touch sugar in any form, for the simple reason that they cannot afford to purchase it. Secondly, they are in the habit of drinking daily large quantities of fermented sour milk summer and winter, which is antiscorbutic and is very beneficial in preserving the teeth. And lastly, they have the habit of chewing a preparation of the resin of the fir tree, a piece of which, tasting like tar, they masticate after every meal, in order specially to clean the teeth and gums of particles of food that may remain after meals. The gum or resin is prepared and sold by all apothecaries in Siberia, and is much used by Russian ladies. The fermented milk is said to be a not very savory drink. First, the milk is cooked and then put into a large vase-shaped utensil made of frozen cows' dung, in which it is allowed to ferment until the winter, when it is broken up into blocks and preserved for use in the cellars all the year round."

GAS EXHAUSTER.

We illustrate one of a pair of exhausters manufactured by Messrs. W. H. Allen & Co., London. These exhausters are an improvement on what is known as Beale's patent, a machine which has been more used in gasworks than any other for exhausting and forcing gas. The improvements of Messrs. Allen consist in making the segments of cast steel with an internal face, so that the gas is prevented from entering the segment—as in the old form—and escape in this direction is thus avoided. By increasing the size of these segments and decreasing their weight, so that the centrifugal force does not come into play, a considerable amount of friction is dispensed with, and scarcely any heat is generated. Some machines of the old form have been known to increase the heat of the gas 10° or 12° in passing through the exhausters only; but in this new form the heat is increased very little. Another improvement consists in making the slide pins of extra large size, and so reducing the wear on these important parts. The exhauster, as now made by Messrs. Allen, is nearly balanced in every way, so that there is an equal strain throughout. The exhauster is combined with, and driven by, a direct acting steam engine, with double crank and fly wheel on the opposite side. The engine is fitted with a very simple, yet effective, single slide expansion valve, and altogether the arrangement is very neat and compact, and as the whole of the working parts, including crank, connecting rod, and crosshead, with their bolts and nuts, are made of steel, the lightness of their parts, with the beauty of workmanship, gives them an excellent appearance. The engines are regulated by a hydraulic governor directly on the engine, as shown. These exhausters are capable of passing 50,000 cubic feet per hour against a pressure of 74 in. of water.—*The Engineer.*



IMPROVED GAS EXHAUSTER

The Candle Tree.

The tallow tree, or, as it is sometimes called, the "candle tree," a native of China, which for a century or more has been used as a popular shade tree in the principal cities of the Southern States along the coast, is now creating some attention in California, as it is thought that tallow can be obtained from these trees cheaper than the illuminating oils at present used in lighthouses and elsewhere. In its native country the seeds and pods of the tree are bruised and then boiled, causing a kind of tallow to rise to the surface, which is much used in the manufacture of candles. The colored candles used in the decorations of our Christmas trees are said to be made from this wax.

Skin Grafting from Rabbits.

Dr. Lamallerée, of Paris, several months ago, performed an operation of skin grafting, employing grafts obtained from two different sources, a human being and a rabbit, those from the latter evincing a superior amount of vitality. The patient, a man thirty-seven years old, had suffered for six years from a varicose ulcer of the left thigh, which resisted every form of treatment. The ulcer was 14 centimeters long and 8 deep. At the request of the patient, Dr. Lamallerée determined upon skin grafting, for which he obtained six grafts from the abdomen of a rabbit, it having been previously shaved, and two from the forearm of a man. These having been placed in position, a Lister dressing was applied. After the lapse of eight days this was removed, and it was found that those furnished by the rabbit had become adherent, and that new skin was forming rapidly in their immediate neighborhood. On the other hand, the two which had been taken from the man had not adhered. The dressing was continued eight days longer. When it was removed an islet of skin, 10 centimeters long and 7 wide, was seen to have established itself upon the center of the ulcer. The dressing was again reapplied, and maintained *in situ* for eight days, at the completion of which it was taken off, and it was found that the sore had completely cicatrized. Two months later the patient was again seen, the healing process was progressing favorably, and the newly formed skin showed no trace of its origin.—*Dr. E. C. Vidal, in Monthly Review of Medicine.*

A Dangerous Cigar Lighter.

Street hawkers have lately taken to selling a "magic cigar lighter," which is calculated to do much mischief. As every student knows, the affinity of sodium for oxygen is so great that it will take the coveted element from water with such rapidity as to cause it to burst into flame. The new lighter is a thin strip of sodium, a fragment of which when placed on the end of a cigar and touched with water, burned with great vehemence.

Few of those who buy the little vials of lighters are aware what vials of wrath they may turn out to be if unskillfully handled. The burning sodium will make an ugly wound if it comes in contact with the skin, which is likely to happen from the sputtering way it has. A sweaty finger is enough to set the stuff ablaze, or a sweaty pocket, should the cork of the bottle chance to come out. As the lighters are bought chiefly by the ignorant, who are taken by the seeming miracle of producing fire by the direct action of water, it is a wonder that no serious accidents with them have been reported. The traffic is not one to be encouraged.

A New Baking Powder.

V. Krebon, in Austria, has invented a baking powder which is made of 180 parts of crude alum, 75 parts of bicarbonate of soda, and 50 parts of the "less basic" phosphate of lime. This last ingredient, which is denominated "less basic phosphate," is the product obtained by pouring ten per cent hydrochloric acid on an equal weight of bone meal burnt white. On pouring water upon this baking powder carbonic acid is formed and sulphate of soda and potash, while the alumina separates. The alum is completely decomposed, so that the inventor considers it harmless. One ounce is sufficient for 1½ pounds of flour.

Sun Spots and Great Storms.

Professor Couch, of Des Moines, Iowa, advises those living in exposed places to provide cellars or caves of refuge for shelter when the sky looks threatening in the southwest. He says that 1882 is the maximum year of the 11·1 years sun spot period, and also the maximum year of two other periods—a long and very long period; and the same degree of energy that gives the maximum sun-spot period also gives the American continent maximum rainfall and a marked degree of force in the effects of its storms; and the end is not yet.

To starch collars, cuffs, etc., so that they will be stiff and glossy as those bought at furnishing stores, add to one quart of the well boiled (corn) starch three ounces of water glass, one ounce of gum arabic, and two ounces of loaf sugar. Use a polishing iron.

Railway Car Telegraph.

The method of train telegraphing invented by Captain C. W. Williams, U.S.A., was recently given a practical trial on the Atlanta and Charlotte Air Line. The invention is described by the Atlanta *Constitution*, of June 21, as follows:

"A line of telegraph wire, broken at suitable intervals, is laid within or beside the railway track, and the disconnected ends of the wire are connected with key blocks placed upon the cross ties, thus forming a continuous telegraph line or circuit over the entire length of the track operated upon. The key blocks have exposed upon their surface two metallic rollers which form part of the circuit, but which by depression disconnect and break the circuit. In other words, while the rollers of the key blocks are in their normal position there is a complete circuit over the whole line; but if any one of them be depressed the circuit at that point is broken. The second part of the device consists of an electric key board or shoe suspended beneath a car at such height that as the car passes over the track it will rest upon and depress the rollers of the key blocks. This shoe also has upon it metal strips of such length that as the car moves along they shall at all times touch upon the rollers of one or the other of the blocks, and is also connected by wires with a telegraph instrument in the cars.

"The *modus operandi* is then as follows: The shoe, touching upon the rollers and depressing them, breaks the main line circuit, which then flows into one of the metal strips of the shoe, thence over one of the wires into the car, through the instrument down the second wire to the second metal shoe plate, from there to the second roller, and then on again down the main line. It will thus be seen that there is no actual breaking of the electric circuit, but merely a deflection of the current through the telegraph car with precisely the same effect as a current is passed through a telegraph office. The results of such an operation are manifest. The car upon the track becomes a telegraph office, may receive or send messages, and may communicate with other trains or outside telegraph offices. Thus the train dispatcher of a railway may be in constant communication with every train upon his road—ready to move them at any instant. Trains may communicate with each other and learn at any instant of time the exact position each occupies."

The test is described by the same paper as follows: "At the trial on Monday everything was in perfect condition. On arrival of the afternoon train from Atlanta a car was found at the junction with the shoe attachment as above described, and a locomotive with steam up ready to take the party, which consisted of representatives of the press and several railroad officials; among the latter Mr. Williams, supervisor of track of the Richmond and Danville Railroad; Mr. Payne, master bridge builder; Mr. Harralson, operator at Toccoa. The telegraph line was found almost a quarter of a mile from the junction. The key blocks were laid at intervals of about 40 feet on wires stretched between. The distance covered was about 200 yards.

"After examining the blocks the party returned to the car and steamed up and down the track. It was found that as the slide struck the first block the instrument in the car clicked its announcement of going into circuit, and thus remained steadily with its lever drawn down to the magnet, only losing circuit as the slide left the last block, thus establishing the continuity of the circuit. The next test applied was the sending of a message from the moving train. A full head of steam was put on, and a run back for a start taken, so that as the blocks were reached a speed of fully twenty-five miles an hour was attained. Click went the instrument, and then Mr. Harralson, without interruption, rattled off a message, which was communicated to a second instrument without the car. Next the test was applied of a train slow in motion, and then of a train standing still, all of which were equally satisfactory, and at last a message was sent into the car in motion from the instrument upon the ground. This was the crowning test, and its successful result met with hearty applause from the onlookers.

"It was the opinion of all who witnessed the test that the complete practicability of the invention was proven. Mr. Harralson said his instrument was as fully under his control while the train was moving as though he had it in his office. Mr. Williams, track supervisor, was satisfied that it was a practicable device and that it would present no serious impediment in track-laying, ballasting, or repairing."

The Teasel Industry.

A correspondent of the *Gardener's Monthly* states that the farmers of the towns of Marcellus and Skaneateles, Onondaga county, N. Y., are quite extensively engaged in the cultivation of the teasel, and that they are annually realizing on the product half a million of dollars. The plant was introduced into that section about fifty years ago by Dr. John Snook. His attempts at cultivation were successful from the start, but such was the prejudice at that epoch against everything American that he was obliged to sell his production as French growth, and it was not until twenty years ago that the American teasel was admitted to be the best grown in the world.

The seed is sown about the beginning of May, and about one month afterward is given its first hoeing. In another two weeks it is ready to thin out, which is done by hand, one plant being left every six inches in the row, and the rows three feet apart. In August the ground is again hoed for the last time in the first season. The second season the horse cultivator is kept at work pretty steadily for two weeks, and the plants that were formed from the seed the first year, throw up a main stalk the second year, and when about two feet high, a leaf makes its appearance, which gradually forms a cup around the stalk; from the base of this other branches arise, and these in turn repeat the process, until the plant has from forty to fifty stalks. On the end of each stalk is a teasel. The cups act as reservoirs, with a capacity of from three to five quarts of water, and thus keep the plant supplied from one rain storm to another. The main stalk teasel is called the "King," and is the male part of the plant. It blossoms first, beginning at its apex and gradually going toward the base, and while this is in operation, it sheds a fine pollen over the other teasels, called queens, by which they are impregnated. They all blossom with a white flower, and as soon as this drops, they are fit to cut. When taken from the fields they are placed in drying sheds built for the purpose, and cured. When they are ready for market, they are bought by dealers, who take them into their factories, and prepare them for the woolen mills. The preparation consists in clipping off, by hand, the beard that grows at the base of the teasels, cutting the stems to about three inches in length, sorting them into four different qualities, into eight different lengths, and gauging them by machinery into thirty-six different diameters. The different lengths, diameters, and qualities are packed systematically in separate boxes, measuring 3½x8½x5 feet. There are seven different houses engaged in shipping, employing from twenty to fifty hands each, throughout the year, with trade extending from San Jose, California, on the West, to St. Petersburg, Russia, on the East, including the Canadas and Mexico.

The Origin of the Sleeping Car.

Mr. W. Barnet Le Van, M.E., of Philadelphia, says:

"From all accounts, no doubt, Napoleon I. used, in 1815, the first 'sleeping, dining room, and parlor car' that ever was built. This car, or chariot, was taken at Waterloo, and was presented to the Prince Regent of England, by whom it was afterward sold to Mr. Bullock for $12,500. It eventually found its way to Madame Tussaud's wax-work exhibition, London, where it may still be seen. This very curious and convenient chariot of the First Emperor was built by Symons, of Brussels, for the Russian campaign, and is adapted for the various purposes of a pantry and a kitchen, for it has places for holding and preparing refreshments, which, by the aid of a lamp, could be heated in the carriage. It served also for a bedroom, a dressing-room, an office, etc. The seat is divided into two by a partition about six inches high. The exterior of this ingenious vehicle is in the form and dimensions of our large coaches, except that it has a projection in front of about two feet, the right-hand half of which is open to the inside to receive the feet, thus forming a bed, while the left-hand half contained a store of various useful things.

"Beyond the projection in front, and nearer to the horses, was the seat for the coachman, ingeniously contrived so as to prevent the driver from viewing the interior of the carriage, and yet so placed as to afford those within a clear sight of the horses and of the surrounding country. Beneath this seat is a receptacle for a box, about 2½ feet in length and 4 inches deep, containing a bedstead of polished steel, which could be fitted up in a couple of minutes. Over the front windows is a roller blind of strong painted canvas, which, when pulled out, excluded rain, while it admitted air. (This might be an advantageous appendage to our present car windows as well as carriages.) On the ceiling of the carriage is a network for carrying small traveling requisites. In a recess there was a secretaire, 10 by 18 inches, which contained nearly a hundred articles presented to Napoleon I. by Marie Louise, under whose care it was fitted up with every luxury and convenience that could be imagined. It contained besides the usual requisites for a dressing box, most of which were of solid gold, a magnificent breakfast service, with plates, candlesticks, knives, forks, spoons, a spirit lamp for making breakfast in the carriage, gold case for Napoleon's gold wash-hand basin, a number of essence bottles, perfumes, and an almost infinite variety of minute articles, down to pins, needles, thread, and silk. Each of these articles were fitted into recesses most ingeniously contrived, and made in the solid wood, in which they were packed close together, and many one within the other, in such a narrow space that, on seeing them arranged, it appeared impossible for them ever to be put into so small a compass. At the bottom of his toilet box, in divided recesses, were 2,000 gold Napoleons ($7,700); on the top of it were writing materials, a looking glass, combs, etc., a liquor case which had two bottles, one of Malaga wine, the other of rum; a silver sandwich box, containing a plate, knives, spoons, pepper and salt boxes, mustard pot, decanter, glasses, etc.; a wardrobe, writing desk, maps, telescopes, arms, etc.; a large silver chronometer, by which the watches of the army were regulated; two merino mattresses, a green velvet traveling cap, also a diamond head dress (tiara), hat, sword, uniform, and an imperial mantle. etc."

Gumption.

Mr. Edward Atkinson, of Boston, recently addressed the members of the Golden Branch Society, of Phillips Exeter Academy, upon "What Advantage Does an American Boy Possess?" Mr. Atkinson urged that the young men who are soon to become the workers and controllers in the business of life should be careful not to become one sided, and not to lose the "gumption" which every Yankee boy ought to possess, and which does not form a part of the curriculum of the school or college, but is developed or lost in that part of the process of education which is outside the books and independent of the teacher. Gumption is that power of applying the work of the hand and the brain together under the quick application of the will, which makes a boy or man ready for any emergency, and enables him to decide at a glance, or with a single thought, the right way of doing something. In the old time, although the organization of the schools was not as perfect as it is to-day, and although the teachers were perhaps not as competent as those of modern time, while the variety of instruction was far less, there was a no less number of able and capable men among the graduates of schools and colleges in proportion to the whole number of pupils than there is to day. The necessity which was imposed on the rich and poor alike to do some part of the work of life with their own hands, while they were attempting to develop their mental powers, worked in the direction of that readiness and versatility which we call gumption. It is obvious to men who have been engaged from very early years in the active work of life, and have been charged with the duty of selecting men to fill important places, that the number of school or college graduates who have been adequately prepared to apply their instruction to immediate use constitutes a painfully small proportion of the whole number. It may be admitted that the only true result of school and college training is to enable a young man to know when and how to begin the real education which must form part of his life, and which will not end except with life, but it ought not to happen that the method of preparation is so ill-advised that it disqualifies the graduate in a measure for the work which he must do. Mr. Atkinson advocated for boys and young men in school and college an organized system of sports as a means of developing manual dexterity, urging the development of hand and brain together. His address throughout was an argument in favor of students endeavoring to acquire not only that knowledge that will enable them to design, but the gumption which facilitates the ready application of knowledge to the execution of design in whatever work may demand their attention and effort.

Egyptian Antiquities.

At the last meeting of the session of the Society of Biblical Archæology, Mr. Lund read a paper identifying Joseph's Pharaoh, under whom the seven years' famine took place, with Amenhotep IV., the disk-worshiping zealot and reformer, at the close of the Eighteenth Dynasty. In speaking to the paper, Mr. Villiers Stuart, M.P., exhibited a large colored drawing, 3 feet by 2 feet, of the remarkable funeral canopy lately discovered near Thebes. Some fragments of the original were also produced. He stated that Queen Isi-em-Kheb, in whose honor the canopy had been made, was a contemporary of Solomon, being mother-in-law to Shishak, who took Jerusalem on Solomon's death. He further exhibited original casts from the bass-reliefs of the tomb discovered and excavated by himself at Thebes. The casts represented the heads of Amenhotep IV. and Khuenaten, which respectively occur on the opposite sides of the tomb façade. Mr. Villiers Stuart pointed out that there could not well be a greater contrast between the two heads, although up to the present time Egyptologists had been of one mind in thinking that the two royal names, Amenhotep and Khuenaten, were but the earlier and later names adopted by the disk-worshiping Pharaoh. But in this tomb Amenhotep was remarkably stout and burly, while Khuenaten was a lean, effeminate-looking man, just as he is represented in the well-known Tel-el-Amarna bass-reliefs. Mr. Villiers Stuart pointed out what he deemed a fatal objection to Mr. Lund's identification. The Bible told us that from Joseph's death to the Exodus the Children of Israel increased from 70 to 1,000,000, and Mr. Villiers Stuart remarked that the 430 years assigned by St. Paul to the Egyptian sojourn would be none too much to allow for that increase, and would just correspond to the interval between Amasis, the founder of the Eighteenth Dynasty, and Menephtha, in whose reign the Egyptian chronicler Manetho dated the Exodus.

Tree Burial in New Zealand.

The recent fall of an enormous puketea tree near Opotiki, New Zealand, disclosed the fact that the hollow interior from the roots to the first fork, about forty-five feet from the ground, had been filled with human bodies. A confused heap of skeletons burst out of the butt of the tree when it fell. A local paper says: "A more extraordinary sight than this monarch of the forest lying prone and discharging a perfect hecatomb of human skeletons can scarcely be conceived. Some are nearly perfect, while others are mixed up in a chaotic mass of heads, hands, feet, and arms, indiscriminately. All the Maoris here seem to have been quite unaware of this natural charnel house, and declare that it must have happened long before their or their fathers' time. Indeed, the appearance of the tree fully justified the supposition that it must have been some hundreds of years since this novel family vault was filled with its ghastly occupants."

A WIRE fence, running from Indian Territory west across the Texas Panhandle, and 35 miles into New Mexico, is projected and largely under contract. Its course will be along the line of the Canadian River, and its purpose is to stop the drift of the northern cattle. The fence will be over 200 miles long.

DECISIONS RELATING TO PATENTS.

THE MACKAY BOOT AND SHOE PATENTS DECLARED INVALID.

United States Circuit Court—Southern District of New York.

MACKAY *et al. vs.* JACKMAN.—SAME *vs.* SCOTT SOLE SEWING MACHINE COMPANY *et al.*—SAME *vs.* LEHMAN *et al.*

Wheeler, J.:

These suits are brought upon two patents originally granted to Lyman R. Blake, dated August 14, 1860, one, No. 29,561, for an improvement in the construction of boots and shoes, and the other, No. 29,562, for an improvement in boots and shoes. These were to run fourteen years, and August 13, 1874, were extended seven years. They were acquired by the orator, and the former was reissued in No. 9,043, dated January 13, 1880, and both have expired since these suits were brought.

Before Blake's inventions boots and shoes were made by pegging through the outer sole, upper, and inner sole, by sewing a welt to the inner sole and upper, and then sewing the outer sole to the welt. Some very light shoes were made wrong side out by sewing through the inner sole, upper, and part way through the outer sole, and then turned, and some very low shoes were made by sewing common stitches directly through the inner sole, upper, and outer sole. Sewing parts of uppers and pieces of leather and cloth for other purposes together by chain stitches made by machine, by drawing loops of the thread through the material, without drawing the rest of the thread through, was then known and practiced; but no boots or shoes made by sewing the soles and upper together by such stitches nor any method of so sewing them together was then known. No means to which that place was accessible for setting the stitches had then been discovered.

Blake invented an improvement in sewing machines by which the soles and uppers of all kinds of boots or shoes could be sewed together without any welt by that kind of stitches, and it was not useful for nor adapted to sewing any other kind of stitches, nor in any other place. This improvement was patented to him in letters patent No. 20,775, dated July 6, 1858, and was highly useful to the public. He made boots and shoes on his machine, and was undoubtedly the first to produce such boots or shoes or to practice that mode of making them. He made application for a patent for this process of making boots and shoes and for the boots and shoes made by this process, as a new manufacture, June 30, 1859. The specification was returned to him for the erasure of one of the claims, with information that claims for the process and product could not be considered in the same application, July 30, 1859. He withdrew the claim for the product, with notice that he intended to renew it in a separate application. April 16, 1860, and did renew it, July 21, 1860. The machine patent was granted for fourteen years, was extended seven years, was owned by the orator, and expired July 6, 1879. The defendant, Jackman, took a lease from the orator of a sewing machine, with the right to use it under all three of the patents during the term of either, for license fees for all boots and shoes made upon it and operated under that license. Since the expiration of the machine patent the defendant, the Scott Sole Sewing Machine Company, has made machines for sewing these boots and shoes by this method, and sold them for use to the defendants in the other cases, who have used them. These bills are brought for relief against these acts as alleged infringement; and in the case against Jackman the bill covers any arrears of license fee there may be for the use of the machine, as this court has jurisdiction of that subject on account of the citizenship of the parties. No question as to that, however, is made for decision.

The machine patent appears to have always been of unquestioned validity. That was so related to the others that any question as to their validity would have been practically unavailing while that was in force, and no question appears to have been really made and contested about either until after that had expired, and the actual validity of these two patents as granted does not appear to have ever been contested until now.

Blake invented means for getting by the uppers and sewing the seams there notwithstanding the uppers. He used his means to sew the seams there and accomplished a great thing; but not because he had made a new kind of seam or given a seam any new quality, but because he had put a well-known seam in a difficult place. This was all due to the machine and its operation, and when he had patented the machine he had patented all there was of it. If, after he had made his machine, and before he had made a boot or shoe with it, some one else, knowing all about it, had, by hand or other known means, made boots or shoes by sewing the soles and uppers together with this stitch, that other person would not have been entitled to a patent for either the process of sewing or the boot or shoe, for there would have been no invention in either. After knowledge of a machine to make a shoe in a particular manner there would be no room for an invention of that manner of making a shoe or of a shoe made in that manner, and there would be no more room for the inventor of the machine than for any one else. It may be doubtful whether such a process or product as these is by itself patentable.

There is, of course, no doubt but that a boot or shoe might be the subject of a patent as an article of manufacture, but there would have to be something new about it as such in the sense of the patent laws. Blake did not invent a boot or shoe, nor a sewed boot or shoe, nor a boot or shoe sewed with this kind of stitches. All those were known and in use before. He invented a machine by which boots and shoes could be sewed with this kind of stitches in parts where they could not be so sewed before. The new effect was due to the operation of the machine. The patentability belonged to the machine, and not to the boot or shoe, as appeared before.

The court held substantially:

1. Where a person has invented a machine for sewing together the soles and uppers of boots and shoes by a chain-stitch without any welt, the stitch itself and the manner of forming it being well known, and the only new effect being the forming of the well-known seam in the well-known manner in a difficult place, theretofore inaccessible by any means that had been discovered, and the inventor had taken out separate patents for the machine, the process, and the product, *Held*, that the entire invention lay in the machine, and that the patents for the process and product were invalid for lack of invention.

2. After knowledge of a machine to make a shoe in a particular manner, there would be no room for an invention of that manner of making a shoe, or of a shoe made in that manner, and there would be no more room for the inventor of the machine than for any one else. It may be doubtful whether such a process or product as this is by itself patentable.

3. Mere mechanical operations like the looping and drawing threads to form stitches in sewing either by machinery or by hand do not amount to arts or processes, and such operations, apart from the means of performing them, do not appear to be within the reach of protection by the patent laws.

4. An article of manufacture, to be the subject of a patent, must be new as such in the sense of the patent laws, and must be the result of invention.

Let decree be entered for an account of license fees in the case against Jackman, and dismissing the bill as to the residue, and dismissing the bills, with costs, in the other cases.

United States Circuit Court.—Western District of Pennsylvania.

AN INVALID REISSUE.—SHERIFF *et al. vs.* FULTON *et al.*

Acheson, D. J.:

This suit is upon reissue letters patent No. 9,199, issued to Hugh Coll, May 18, 1880, the bill charging infringement and praying for an injunction, etc. The original letters patent, No. 110,205, were issued to Coll, December 20, 1870. The invention, as the original and reissue both recite, consists in improvements to a siphon pump, patented to said Coll, June 8, 1869.

The court held substantially:

1. An inventor, having in his original patent limited his claim of invention to a specified detail of construction, cannot, after a lapse of nine years, procure a valid reissue embodying the enlarged and comprehensive claims that might have been allowed in the original patent.

2. An acquiescence by the patentee and his assignees for a period of nine years in the terms of the patent as originally granted creates an equitable estoppel in favor of the public.

3. Doubted whether, after a delay of nine years, the claim of a patent can be materially enlarged upon the suggestion that the original claim was defective in form and required amendment.

Bill dismissed.

Changes at Niagara Falls.—The Spouting Horseshoe.

A *Times* correspondent at Niagara notes that since the fall of Table Rock, thirty-two years ago, the Horseshoe Falls have lost that regularity of outline which suggested their name, and indentations in at least two spots give them an angular appearance not unlike the letter W in general shape. This is accounted for by the wearing away of the brink more rapidly at these two points than anywhere else along the entire edge of the Canadian falls. Another change, and one at which the natives of these parts greatly marvel, is the spouting of water by these same Horseshoe Falls. The older and more observing villagers solemnly declare that this curious spectacle has been growing more and more noticeable for the past three years, until it has become so well defined that the name of the Spouting Horseshoe is now applied to that portion of the Canadian Falls. None of them pretend to know the cause of this singular action of the waters. They content themselves with pointing it out as another curious freak of nature, bound to add a new attraction to the vicinity and to swell an income which has never been inconsiderable in the dullest of summers. It is best observed on a clear sunshiny day, when but little wind disturbs the surface of the river. From the center of the Suspension Bridge, which is a short quarter of a mile below the Horseshoe, the spouting is clearly visible. On such a day the clouds of vapor barely rise to a height of two-thirds of the falls, and the brink is never obscured by fine mist. Under such conditions the eye has an unobstructed view of the dark blue waters as they hurry toward the edge of the precipice, only to be transformed into a broad sheet of milky whiteness, when they take the plunge and disappear in the eternal clouds of mist that envelop the foot of the cataract. Suddenly there rises to a level with the top of the falls a mass of spray, increasing in volume and rising in height until from out their midst spout a number of well-defined jets which mount upward many feet and then melt away in vapor. Assuming 150 feet, the generally recognised figure, to be the altitude of the Horseshoe Falls, these jets seemingly must shoot upward to a height of 200 feet. They certainly add a variety to the scene, and attract at once the attention of visitors. The duration of this phenomenon, if such it can be called, is from 10 to 15 seconds. The clouds of vapor, like volumes of white smoke, continue to fill the air above the Horseshoe for full half a minute after the jets have lost all outline, and then they, too, gradually die away, and for about 10 seconds longer the spot is again free from all turbulence, and nothing but a stretch of waters as far as the rapids is presented to the view. Sometimes these jets of water drop their tassel-like tips in a graceful arch, inclining toward the Canadian shore, and again they fall over upon the brink of the Horseshoe. The regularity with which these slender, tapering jets appear and disappear is one of the features of a peculiar exhibition which promises to excite as much attention as any disturbance in the outline of the falls themselves that has been noted in recent years.

Manufacture of Wine from Raisins in France.

British Consul Taylor, of Marseilles, states, in his last report, that since the first appearance of the phylloxera in the vineyards of France, there has been a steady diminution in the quality of wine produced, and in a tabular statement, he shows that the quantity produced in 1880 amounted to 29,677,472 hectoliters, against 56,406,363 hectoliters in 1877, and this year itself was, by several millions of hectoliters, less than the average of previous years. To make up for this deficiency, a novel product, made out of dried raisins, was introduced. In the year 1880, at the port of Marseilles alone, 36,394,527 kilogrammes of raisins and dried currants were imported, and according to Consul Taylor, all the raisins or currants coming from the East, viz., over 30,000,000 killogrammes, were used in the preparation of this raisin wine; and when it is taken into consideration that 100 kilogrammes of raisins are capable of yielding 325 liters of wine, an idea may be formed of the quantities of wine of this description which have been manufactured at Marseilles alone. It appears that the process employed in the manufacture of wine out of raisins does not differ in any material degree from that in the manufacture of ordinary grape wines. It is assumed that the grape in going through the process of desiccation loses none of its original elements, save the water which enters into and forms about 80 per cent. of its composition. By restoring this lost water, the raisin becomes capable of yielding the same liquor as before it was dried. The raisins are carefully cleansed and freed from all impurities, and then allowed to soak in a tub with a quantity of water equal to the quantity of wine that is to be manufactured, distilled water, when possible, being used. The time during which the raisin is to soak is forty-eight to fifty hours in winter and about forty hours in summer. It is frequently and carefully stirred, and is sufficiently soaked when it has resumed the appearance of a fresh grape, and when being pressed between the forefinger and thumb, it breaks with a report. This being done, the usual course for the preparation of wine is strictly followed, a little more care only being required. The raisin is crushed in the usual way, and placed in the fermenting tub, being well stirred at the beginning, in order to separate the grains from each other, and to commence a regular fermentation. The "must" is kept at a temperature of 15° Centigrade, and the cellar at an invariable temperature of from 15° to 20° Centigrade. When properly conducted, the fermentation is completed in twelve days, and the raisin wine is then ready to be drawn and put into casks, the usual process of sulphurizing, clarifying, etc., being followed. The wine is then claimed to be composed of exactly the same principles as fresh grape wine, but differs from it by its color, as it is invariably white, or at the best, straw-colored. The wine produced in the Bouches du Rhône district is dark red, strongly alcoholized wine, and accordingly the raisin wine is colored by artificial means, and frequently with deleterious compounds, some of the dyeing stuffs used for the purpose being, it is said, extremely injurious to health. Consul Taylor states that scarcely a week passes at Marseilles without a large quantity of wine thus adulterated being condemned by the local authorities and poured out into the sea. The raisin wine is also largely used in its natural state, that is to say, without being colored by artificial means, by simply mixing it with red wines that are so deep in color that the addition of a certain quantity of raisin wine improves both. The central administration, which at first denounced the manufacture of raisin wine in France as an offense, and made the manufacturer liable to a prosecution for falsification of wine, has now, and for some time, entirely changed its view of the matter. All the hinderances opposed in the beginning to this branch of industry have been removed, and at the present time there is no distinction made between the raisin and the grape wine, both productions being submitted to the same charges and duties, and recorded under the same headings in all the official books and returns.

PROFESSOR EDWARD C. PICKERING, of Harvard College, says that, in undertaking to measure the intensity of the light of the satellites of Mars, he had occasion to need an extremely small hole. A hole about the *twenty five-hundredth* part of an inch in diameter was finally secured.

MOORE COUNTY GRIT MILL STONES.

For grinding wheat the new roller process seems in a measure to have supplanted the French burrs, but for grinding corn for table use the stones and burrs, dressed and put up in a proper manner, are superior to anything else. Few quarries of stones suitable for grinding corn into meal for table use have been discovered. We have the well-known French burr, which is considered by some superior to all others for the purpose; the Cologne stone of Germany; the Esopus stone of New York; and the "Moore County Grit" of North Carolina. Outside of these there are few millstones used, and none that are well known commercially.

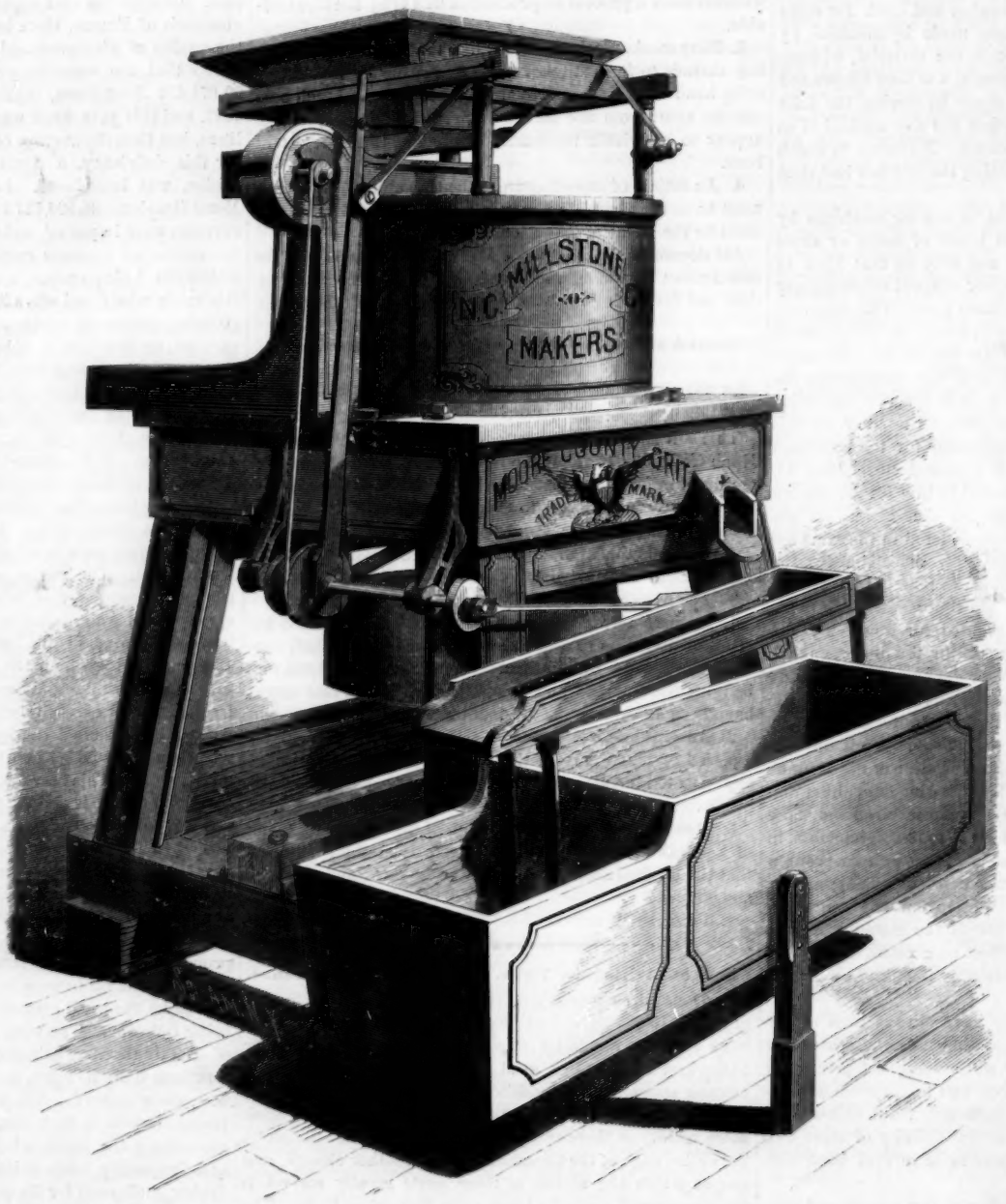
Though discovered over 100 years ago, and used by Lord Cornwallis in his army mills when in North Carolina, the Moore County Grit has until recently been but little known except within a hundred miles or so of the quarry. This may be attributed to the distance of the quarry from railways and other means of cheap transportation, and to the more potent fact that the quarry lies in a State that did not begin to foster manufacturing enterprises until after the war.

In 1879 the entire vein and a large tract of land were purchased by J. E. Taylor, President of the Taylor Manufacturing Company, of Westminster, Md., and a stock company formed under the name of "North Carolina Millstone Company." This company have gradually developed the quarries, and have quite a little village in the woods sixteen miles from nearest railroad. They have erected their own telephone line from the railroad to the quarries, and are now employing about forty men in quarrying stones of all sizes, and in the manufacture of two sizes of corn mills, 30 and 36 inches in diameter.

It is claimed for this grit that, from the peculiar formation of the stone, it will grind longer without dressing than any other; its peculiar nature—a cement mixed with flint—causes it to wear sharp and not glaze. In some cases a 48-inch pair of stones has ground over 4,000 bushels with one dress; a 30 or 36 inch stone will grind from 1,500 to 2,000 bushels with one dress They hold their edge to a remarkable degree, and the meal is very round and light.

A bushel of corn will make from one bushel and ten quarts to one bushel and fourteen quarts of meal, and the meal is very light, and superior for table use. It is also claimed that less power is used to grind a given number of bushels with this burr than with others, on account of its sharpness.

The cut represents a 30-inch "Moore County Grit" upper runner mill, with silent feed, exhaust fan, sifter, and meal box. The sifter can be detached at will when not desired, and so can the fan. The corn is fed through eye of fan into a funnel that delivers the corn on the under stone and prevents any tendency to chock in the eye, even if speed varies.



MOORE COUNTY GRIT MILL.

The manufacturers do not claim for these mills as great capacity as can be got from an under runner, or a vertical mill, as in these any pressure can be obtained, and a very small mill will put a 40 horse power engine to the test to drive it. Quality of meal in these machines is not considered as much as quantity. It is claimed that a 30-inch Moore County Grit Mill will grind 6 bushels, and the 36-inch 8 bushels per hour, into as fine meal as can be made on any water or stationary mill. If the fineness is decreased, of course, quantity is increased. For chop or mixed grain double the quantity named can be produced.

The words "Moore County Grit," together with representation on cut, have been secured as a trademark. Patents on mill are pending. In the South, where good table meal is appreciated, the manufacturers have done a large trade. They are sending stones and mills to all parts of the country. This industry seems destined to grow to large proportions, as the vein of the stone is practically inexhaustible.

Further particulars may be obtained by addressing the N. C. Mill Stone Co., Westminster, Md.

The Jones Process of Preserving Meat.

An exhibition of a new process of preserving meat was recently made in London. In this process, instead of steeping the dead meat in an antiseptic, the preservative chemical is introduced into the live animal, and by the action of the heart is sent through the blood vessels and capillaries into every part of the body.

The sheep, which was first stunned by a smart blow on the head given with a wooden mallet, showed no signs of consciousness or sensibility throughout the operation. A veterinary surgeon laid bare the left jugular vein, and using an ordinary surgical trocar and canula, drew off about a pint of blood. The preservative chemical, dissolved in warm water and kept at blood heat by a hot water jacket surrounding the tin can in which it was held, was then allowed to flow through an India-rubber tube placed to the orifice of the canula into the vein, about two pints being thus injected. As soon as the charge had run into the animal the canula was plugged, and about two minutes were allowed for the injected fluid to pass through the whole vascular system. The sheep was then stuck by a butcher in the ordinary way. Another sheep was then similarly treated, the whole operation in each case occupying from four to five minutes from the time the animal was stunned until it was carried out dead.

The antiseptic used is boracic acid, which, it is said, does not in the slightest degree affect the flavor or quality of the meat, while the results of experiments show that meat thus treated will in this country keep perfectly good without the use of ice or refrigerators for five or six weeks in summer and two or three months in cold weather. The cost of the chemical, it is stated, would be at the outside 10 to 12 cents per sheep, and the only apparatus required would be a tank in which by means of a sand bath the boracic acid could be kept at blood heat ready for use when killing was going on.

CHLORINE may be prepared economically by heating in a stoneware or glass retort a mixture composed of common salt, 10 parts (by weight); manganese dioxide (black oxide), 8 parts; sulphuric acid, 24 parts; water, 12 parts. When this gas is passed through cold water, the water dissolves a considerable portion of it, and the solution (chlorine water) may be employed instead of the gas for bleaching purposes.

A Remarkable Meteor.

Mr. John G. Henry, of Havana, in this State, has been laboriously reinvestigating the remarkable meteor of July 20, 1860, and reaches some noteworthy conclusions. This meteor was visible over a belt of country fourteen hundred miles long and several hundred miles wide, its path being sensibly a straight line as it moved from over Lake Michigan to a point south of Rhode Island. It was carefully studied by Professors Lyman and Bond, who at the time published their conclusions. Mr. Henry thinks he has proved that it was an asteroid with a diameter of sixty rods, and that after grazing the earth's upper atmosphere it sped on its way into the depth of space with an actual velocity of eighty thousand miles per hour.

According to Professor Lyman's data this meteor, the apparent disk of which was one-half that of the moon, approached nearest the earth (forty-one miles) a little south of Rhode Island, passed forty-two miles above Long Island Sound, forty-four miles over the Hudson, fifty-one miles over Elmira, and sixty-two over Buffalo. If these data are correct it would seem probable that under the earth's attraction it finally entered the Atlantic Ocean. It was also seen out at sea a distance of three hundred miles off our Atlantic coast. But these data do not invalidate Mr. Henry's conclusion, which is virtually that reached by Professor Bond, director of the Cambridge Observatory, that the meteor "came to us from the region of the fixed stars, and, after barely grazing the outer limits of our atmosphere, probably passed out of the attractive influence both of the earth and of the sun."

The remarkable meteor of August 18, 1783—which Sir John Herschel instances as one of many metallic or stony masses that are "extraneous to our planet"—traversed the whole of Europe from Shetland to Rome "with the velocity of about thirty miles per second, at a height of fifty miles from the surface of the earth, with a light greatly surpassing that of the full moon and a real diameter of fully half a mile." The size and velocity of this meteor greatly exceeded those computed by Mr. Henry for the meteor of July, 1860, so that there is no reason to question his conclusions.—*New York Herald.*

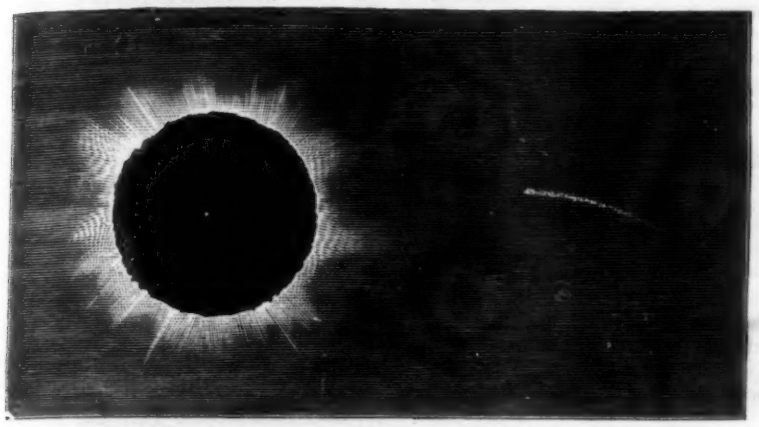
Modern Plumbing.

The following general recommendations are suitable for plumbing most modern dwellings: (1) No trap on the main drain, between the house and sewer or cesspool; (2) the soil pipe to be extended through the roof, at its full size, and ending away from chimneys or windows. If any one has any doubt of the necessity of this provision, let him simply take note of the obnoxious vapors which pour out of any of these openings, and which sometimes find their way into neighbors' windows, when the latter chance to be higher than the top of the soil pipe; (3) traps to be placed on all fixtures, with suitable vent pipes to prevent siphonage; (4) securing absolute freedom from soil dampness in cellar and vicinity of foundation by proper drains; (5) the furnace cold air box to be raised above ground to exclude soil moisture; (6) all underground drains to be tested when laid, to insure that they are not broken, and preference given to tarred iron pipe, with gas tight joints, carried along the cellar wall; (7) the tank overflow, refrigerator, and safe wastes not to connect with the sewer under any circumstances, but to run direct to the cellar, or to end over the kitchen sink; (8) no soil pipe to connect with a chimney flue; (9) no pan water closet to be countenanced, or any closet, without a cistern to keep it well flushed; (10) no well to be located within two hundred feet of a cesspool; (11) no garbage or vegetables to be stored in a damp or unventilated cellar; (12) all cesspools to be ventilated by two openings.—*Century.*

FOR a number of years a German paper maker has been utilizing the waste water from his engines, conducting it by ditches to and upon the meadows adjoining his mill. He asserts that his profits from his grass crop have been trebled.

THE ECLIPSE AS SEEN ON THE NILE.

For the observation of the total eclipse of the sun, which took place on the 17th ult., a point on the river Nile, in Egypt, was selected by prominent European astronomers. We have in previous numbers given an account of some of the results of the various observations. We now present some further particulars, and also illustrations, which include a picture of the instruments in position, and a view of the new comet, seen close to the sun at the moment of totality, the engravings being from *L'Illustracion*; and a view of the temporary observing station, on the bank of the Nile, is from the *Illustrated London News*. We also give, from the same journal, another view of the grand old river Nile, during one of the annual inundations, with the Great Pyramid in the distance. We recently printed in our SUPPLEMENT (No. 332) an interesting article by Mr. Richard A. Proctor, in which some very strong arguments were presented going to show that the Great Pyramid, in addition to its use as a burial place for royalty, was especially constructed as an astronomical observatory The main passage way into the interior of the Pyramid forms an inclined tube that points to the polar star. Within this tube the Egyptian astronomers observed the heavenly bodies, computed their motions, and determined the procession of the seasons. This was the most perfect observatory ever made, until telescopic art revealed a mode of exact observation without the aid of such massive structures.



FROM A PHOTOGRAPH SHOWING THE ECLIPSE AND THE COMET NEAR THE SUN

ARRANGEMENT OF INSTRUMENTS USED IN OBSERVING THE ECLIPSE.

The British scientific expedition lately sent to the banks of the Upper Nile was commissioned to make observations of the total eclipse of the sun there visible, during one minute and twelve seconds of time, on Wednesday, the 17th of June; and these observations have been made with entire success. The chief members of the expedition were Mr. Norman Lockyer and Dr. Arthur Schuster, assisted by Mr. Woods (who was deputed by Captain Abney), and also by Mr. Lawrence, and accompanied by Mr. W. Black, and others. On their arrival in Egypt they were received by Esmat Effendi, an Egyptian astronomer, one of the household of the Khedive, and by Stone Pasha, Chief of the Egyptian Staff. A suitable place for their temporary observatory had been chosen at Sohag, on the Nile, seventy miles above Thebes; and there was a steamboat, placed by the Khedive's Government at the disposal of the English and French expeditions, which conveyed them to their destination without delay. The Governor of the district of Sohag also furnished a dahabiyeh, or river-boat, with an escort and guard of soldiers; and Colonel Moktar Bey was most active in assisting the expedition.

We give an engraving from a photograph of the scene at Sohag, with the encampment and temporary establishment of the astronomers and their party. At the right hand of the view is the tent used as a store-room; next this is an inclosure, protected by a cane fence, in which were placed Mr. Lockyer's two six-inch telescopes, and Dr. Schuster's photo-heliograph, which was to be used in the same manner as in his expedition to Siam, in 1875, but with the greatly improved apparatus devised by Captain Abney. The steamer and the dahabiyeh, above mentioned, are shown lying in the river; several members of the expedition, attendants, and Egyptian soldiers are seen in the foreground; and there is one of the simple native machines for raising water from the Nile to irrigate the fields. The new comet is to be named Tewfik, after his Highness the Khedive. The special correspondent of the London *Daily News*, who was present during the eclipse, says:

"This eventful morning was the finest we have yet had, cool and without a cloud. A great crowd of natives in picturesque costumes lined the road and the hill between the camp and Sohag. The shore of the Nile, except before the observatories, was packed with dahabiyehs bringing the governors of the provinces and other notables to observe the eclipse and do honor to the strangers. Thanks to Moktar Bey, in charge of the camp, and a force of soldiery, there was no confusion. Along a line of three hundred yards the French, English, and Italian observers were left in undisturbed possession of tents and observatories. Nevertheless, while the sky darkened and assumed a leaden hue, the hills bounding the Nile bathed in purple, the great silence gave way, and from river and palm-shaded slope arose a shout of wonder and fear, which reached its climax at the moment of the sun's disappearance; nor ceased then, for, in addition to the horror of an eclipse—which the natives here, as in India, attribute to the act of a dragon—there appeared in the heavens on the right of the sun an unmistakable scimetar. The eclipse had, in fact, revealed the existence of a new comet. Despite the short totality, many valuable results have been obtained. I am permitted to send a copy of the collective telegram sent to the various Governments, showing many new facts touching the sun's atmosphere; though matters have not become much simpler, which means more work. The layer, to which much absorption has been ascribed, seems vanishing from existence. The band K in the spectrum of the corona fully explains the eclipse coloring.

"Among the results, the most satisfactory are photographs of the corona, and a complete spectrum obtained by Schuster on Abney's plates. H and K are the most intense lines. A study of the red end of the spectrum of corona and protuberances was made by Tacchini. A comet near the sun was a striking object; it was photographed and observed by the naked eye. Bright lines were observed before and after totality at different heights by Lockyer, with intensities differing from Fraunhofer's lines; by Lockyer and Trépied an absolute determination was made of the place of the coronal line 1474 in Kirchhoff's scale; by Thollon and Trépied the absence of dark lines from the coronal spectrum was noted. Tacchini and Thollon, with very different dispersions, noted many bright lines in the violet. Thollon observed spectrum of the corona, and Schuster photographed it. The hydrogen and coronal line were studied in the grating spectroscope by Buisieux, and with direct vision prism by Thollon. Rings were observed in the grating by Lockyer, of the first, second, and third order. The continuous spectrum is fainter than 1878, stronger than 1871. An intensification of the absorption lines was observed in group B, at moon's edge, by Trépied and Thollon.

"The whole of the spectrum with blue lines on a continuous background has been photographed. Prominences photographed with the prismatic camera (showing, of course, ring spectrum). Three photographs taken of the corona. A comet close to sun photographed with the prismatic and also ordinary cameras."

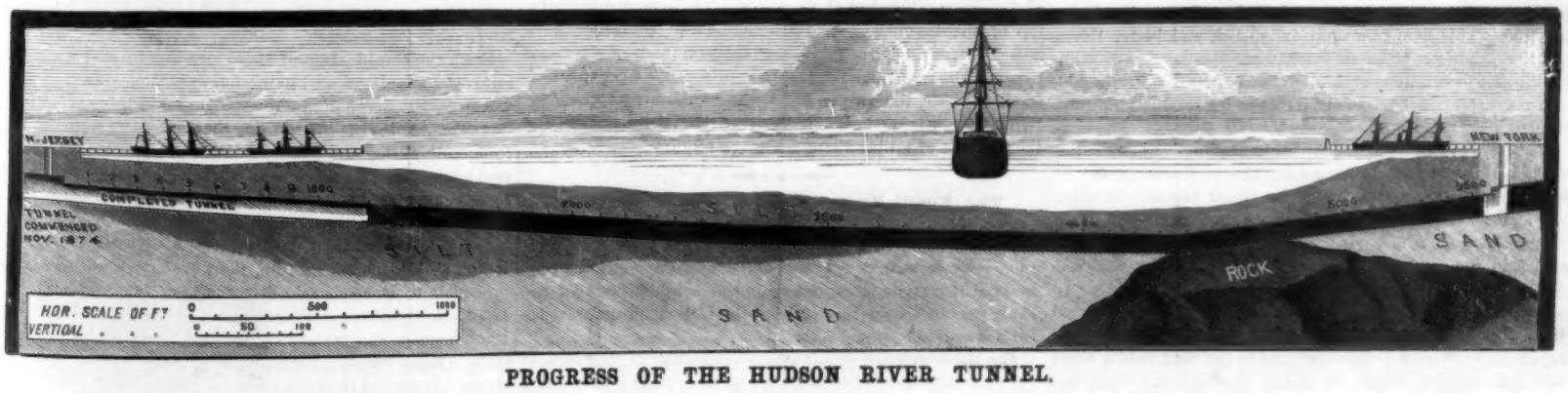
THE greatest pressure in a steam boiler is at the bottom. The water adds 1 pound pressure for each 27 inches depth.

Sonorous Vibrations.

At a recent meeting of the London Physical Society, Mr. W. F. Stanley read a paper on "Sonorous Vibrations," especially those of the tuning fork. The larger and more visible movements of a sounding body do not appear to be best fitted to propagate musical sounds, as was shown by placing disks on the prongs of a powerful fork, which, when vibrating, could then only be heard a short distance, whereas by its smaller longitudinal motions when placed on its resonator it produced a penetrating sound. The vibration down the stem of the fork was shown not to depend upon a vibrating ventroid, as suggested by Chladni, for a fork cut in the end of a solid steel bar communicated sonorous vibrations equally well to the resonator. To set a fork in vibration it was necessary to bow one prong only; therefore, in this case, the vibration must proceed along the prongs. A light fork, one meter long, was fixed in a heavy vise, and it was shown by it that vibrations passed down one prong and up the other alternately. By means of dust, ripples were shown to run down an ordinary fork in vibration. Light pieces of metal were fitted to the ends of a powerful fork, and these immersed in mercury, the reflected surface of which was shown on a screen, where it was seen that the whole mercury surface was broken into fine ripples. It was suggested that such small waves are also perceived by the ear. By these, certain conditions of harmonics could be better accounted for, as, for example, by division; in smaller waves the rarefaction of a note in space would not suffer interference by the condensation of its octave falling in the same space and time.

PROGRESS OF THE HUDSON RIVER TUNNEL.

The accompanying diagram shows the progress of the excavation of the tunnel under the Hudson River. The advance during the past six months on the New Jersey side has been very rapid, the North Tunnel having been carried forward over 500 feet beyond the point indicated in our issue of Feb. 4. The completed tunnel now measures 1,200 feet. The character of the river bed continues to be the same tough silt encountered nearer the shore. Owing to the descending slope of the tunnel, the air pressure has been increased with the advance of the work, so that it is now 30 pounds to the square inch. The tunnel is divided by two bulkheads, the first about 450 feet from the caisson, the second about the same distance in advance. No work has been done on the South Tunnel.



PROGRESS OF THE HUDSON RIVER TUNNEL.

Shad on the Northern Pacific Coast.

The first shad caught north of the Columbia River were taken from Puget Sound, at Olympia, Washington Territory, in the latter part of May. One was full grown. Five years ago shad eggs were sent from the Atlantic by the United States Fish Commission and put in the Sacramento River, and young ones have occasionally been caught in Monterey, San Francisco, and Humboldt Bays since that time. Two years ago one or two were caught in the Columbia, and quite a number last year.

An Interstellar Resisting Medium.

O. Backlund recently made a brief report to the St. Petersburg Academy on his investigation of the hypothesis of a resisting medium in space, from which the *Naturforscher* extracts the following:

Encke's hypothesis of a medium filling interstellar space has met with no serious opposition from scientific men. Encke himself thought that it received strong confirmation from the theory of the comet that also bears his name. Asten, who has continued the theory of these comets since 1848, advocated Encke's hypothesis, and believed that his results offered a still stronger proof of the correctness of the hypothesis. Encke first found that the periodic time of the comet referred to decreased by time proportional to the square of the time, and he proposed this hypothesis: Interstellar (or interplanetary) space is filled with some substance that gravitates toward the sun, and its density decreases inversely as the square of the distance; it therefore offers resistance to the motion of the heavenly bodies, which is proportional to the square of their velocity. It can be proven mathematically that such a medium must cause secular as well as periodical disturbances in their mean motions and eccentricity, but only a periodical one in the length of the perihelion. The period of the periodical disturbance agrees with the orbit, but such a medium has no effect on the inclination of the orbit or on the nodes.

Since Encke only took strictly into account the disturbance that took place in its mean motion, and did not investigate the periodical members of this disturbance, the theory of the comet named after him afforded no proof of the correctness of the hypothesis; for, if we are to adhere to the existence of a resisting medium, an infinite number of suppositions can be made concerning the properties of this medium, all of which shall fulfill the requirements mentioned.

An essential limitation of the possible number of hypotheses has been established by Asten's investigation, inasmuch as he independently deduced the secular disturbance in its mean motion and eccentricity from the observations.

The results of my investigations regarding this resisting medium are of a negative character, and can be summarized as follows:

As yet the treatment of the theory of Encke's comet has really proved nothing regarding the existence of a resisting medium in space.

If any one should succeed, on any hypothesis whatever, in explaining the increased mean motion, and the decreased eccentricity, during the interval between 1819 and 1848, so simple a hypothesis will not suffice to explain the course of the comet of 1865, inasmuch as the mean motion has very probably changed since that time. After the phenomena from 1865 to 1881 have been fully worked out, and their relation to former phenomena ascertained, it will probably be impossible to find out the nature of the hitherto unknown forces acting upon comets.

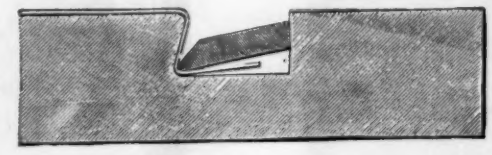
Petroleum's Surprises and Disappointments.

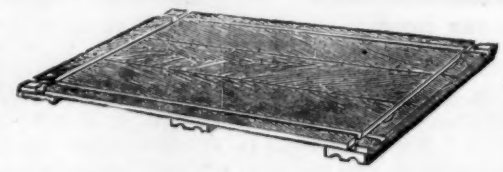
The history of the discoveries in the oil fields in this country has been one of a series of disappointments to the producers. From 1866 to 1872 the price per barrel averaged from $4 to $5, and the producers were making money rapidly. Then the field in Butler County was struck, and from that day to this the production has been greater than the consumption. Before Butler had begun to decline the Clarion field was opened. Then came the Bullion pool with its 2,000 and 3,000 barrel wells, which forced the price down to $1.50. This field was soon exhausted, and better times for the producers were at hand, when the Bradford field, the largest in extent ever known, was opened. For nearly five years the Bradford field increased its production, until it had a daily out-put of over 100,000 barrels. The consumption was not over one-half this amount, and, with the Standard Oil monopoly squeezing the producers, many of them went to the wall. Then Bradford began to decline, and again a silver lining was seen in the cloud; but again disappointment came. In May, 1881, the first well was struck in Allegany County, New York, and a new field was opened which soon more than made up for the decline. In the spring of the present year the Allegany field showed that it had passed the climax and was on the decline, and again the producers looked forward to the near future when the consumption would equal the production. Then was the great "646" mystery struck, and with it followed disaster to the owners of wells generally, and lower priced oil than since the summer of 1874, when for a short time it sold for 45 cents a barrel. Where the next field will be is only a matter of conjecture.

The only time when the excitement over a new oil field was as great as that now reigning in the Cherry Grove district was in 1865, when the Pithole fever took possession of the public. The first well was opened there in May of that year. In less than two months Pithole was a city of considerable proportions, and within six months it had 8,000 inhabitants and almost as large a floating population. At the pinnacle of its greatness it had fifty hotels, some of them palatial and gorgeous, and one of which cost $80,000. It had miles of streets lined with banks and all kinds of business establishments. A $50,000 transaction was considered of small account, and, miscalculating the future of the place, wealth was squandered on new enterprises which in the minds of its citizens promised fabulous fortunes; but Pithole was only a child of six months' growth when it began to exhibit symptoms of an early decay, and it declined almost as rapidly as it sprang up. The *Tribune* correspondent visited Pithole the other day and found only one voter living in the place. The railroad was long ago torn up, and most of the houses were torn down. Two of the streets are still open, and beside them remains a pitiful scattering of old houses in the last stages of decay. Fields of corn and oats stretch over the streets and squares where once were gaudy theaters and dance-houses, gorgeous saloons and mammoth hotels. When the oil fever was high a half acre of what is now waste pasture-land was sold at a rate equivalent to $100,000 an acre. Over on the hill still lives old Mr. Copeland, who in 1865 refused an offer of $700,000 for his farm. Two years later he would have taken as many cents. He still owns it, and his daughter teaches school and supports the family. In all this there may be a lesson for speculators at Garfield to-day.—*N. Y. Tribune.*

DRAWING BOARD PAPER HOLDER.

The accompanying engravings show a very neat and ingenious device for stretching and holding drawing paper on drawing boards without the use of glue or pins. It avoids the necessity of the frequent cleansing of the board by washing, planing, or scraping, accompanied with their attendant "messing" and loss of time; it also prevents the roughening of the board by the accumulation of pin holes. It is exceedingly simple, consisting only of four rectangular channel grooves, each furnished with a thin lath of hard





wood placed at an angle. The paper when mounted is firmly secured, and cannot lose its grip, as from the angular position of the laths they act as a powerful circular wedge against the paper by the contraction of the latter in drying. In mounting the paper, it is first wetted on the board in the usual way, and a piece 5/8 in. square is cut out of each corner; its edges are then placed over the grooves equally all round, and pressed down into the bottom corner of the inner side of the grooves with the beveled narrow edge of the laths; the latter is then turned over till its other —angular—side rests against the outer side of grooves near the top, forming an angle downward to the bottom inner corner. The paper in contracting by drying, draws the lower beveled edge of the laths upon a radius from the outer angular edges into a gradually narrowing space in grooves, thus acting as powerful circular wedges against the paper, firmly fixing it against the inner side of grooves, and are jammed tighter in proportion as the paper contracts more. The paper is gripped close to the edge, and a drawing can be made on to it within 5/8 in. of the edges of the standard sizes of the paper. Tracing cloth or paper can be mounted on the top of the drawing paper in the same way, by taking each lath up separately, refixing the same on the top of tracing paper in the same manner. In mounting both the paper and tracing paper, the two ends should be done first, then the two sides. Finger holes are provided behind the laths for the purpose of taking them out when required.

The Fossil Trees in the National Museum, Washington.

The Smithsonian Institution has received from Fort Wingate, New Mexico, a car load of curiosities, including portions of two stone trees, one from the neighborhood of the Fort, the other from the banks of the Lithodendron, 20 miles from Navajoe Springs, Arizona.

For these massive specimens the museum is indebted to the thoughtfulness of General Sherman, who, while crossing the continent in 1878, suggested to Colonel Swaine, then in command at Fort Wingate, the expediency of securing them.

Acting upon this suggestion, an expedition was organized early in the spring of 1879 to proceed to the Lithodendron (stone trees) in Arizona. Thomas V. Kearns, a gentleman of long residence in that part of the country, and familiar with the locality to be explored, kindly volunteered his services, and success was, in a great measure, due to his efforts in carrying out the wishes of the General. The military detail consisted of Second Lieut. J. T. C. Hegewald, one sergeant, and twelve soldiers, all of the Fifteenth United States Infantry, and the party was well supplied with army wagon running gears specially arranged for hauling stone, and with tools and appliances complete.

In his report of the expedition Lieutenant Hegewald says that the Navajoes, who were pasturing their sheep about the head waters of the Lithodendron, thought it very strange that the "Great Father in Washington" should want some of the bones of the "Great Giant" their forefathers had killed years ago when taking possession of the country, the *lava beds* being the remains of the blood that ran from his wounds. Specimens by thousands were found on each side of the valley of the Lithodendron, there about half a mile wide. Along the slopes, which were perhaps 50 feet high, no vegetation whatever was to be seen; wood being very scarce, the soil was composed of clay and sand mostly, and the petrifactions, broken into millions of pieces, lay scattered all adown the slopes. Some of the large fossil trees were well preserved, though the action of the heat and cold had broken most of them in sections from 2 to 10 feet long. Many of them must have been immense trees; several which Lieutenant Hegewald measured were from 150 to 200 feet in length, and from 2 to 4½ feet in diameter, the centers often containing beautiful quartz crystals.

Only one of the two specimens obtained from the Lithodendron by Mr. Kearns and Lieutenant Hegewald was forwarded to Washington. In the place of the second one brought in from the locality of the Lithodendron, a better specimen was found on the Mesa, to the north of and adjacent to Fort Wingate. The specimens had to be hauled to Santa Fé, New Mexico, to be shipped by rail.

New Progress in Telephony.

A new advance has been made by this remarkable instrument. Mr. Van Rysselberghe has just devised a new system of telephone differing very sensibly from all those known. The arrangement and details of the apparatus have not as yet been made known to us, but the following result of some experiments that have just been made with it are communicated to *La Lumiere Electrique* by Mr. F. Geraldy:

The system had first been put in operation on the line from Brussels to Ostend, but its inventor, desiring to experiment with it to a greater distance, has just tried it between Paris and Brussels. . . .

Through the kindness of Mr. Van Rysselberghe I was permitted to be present at the experiments on the 17th of May. I ascertained that conversation between Paris and Brussels was easy, that articulation was clear, and that it was not necessary to speak loud, but only in a clear and distinct voice—that, however, being required by the telephone.

Such a result, were it the only one obtained, would doubtless not be absolutely new, for our readers will recall the experiments at great distances with the Herz system, that we have had occasion to describe. Various attempts of this nature have been made with more or less success, but we may say that that of Mr. Van Rysselberghe has succeeded better than any that has been tried. But that is only one feature of the system.

The inventor has bestowed his attention on a means of overcoming that terrible enemy of the telephone, induction. On this subject, I recall anew the studies made by Mr. Herz, on a means of employing the condenser in telephone lines as a preserver as well as receiver. The process employed by Mr. Van Rysselberghe has some points of contact with those experiments, while very sensibly differing from them. Mr. Van Rysselberghe, by an ingenious detour, instead of guarding against induction on the telephone line where it produces its injurious action, endeavors to prevent its occurrence by suppressing it in the lines on which it is produced. To this point we shall hereafter return more in detail. He has experimented, however, only imperfectly at Paris, where there was no time during these first experiments, designed only as a study, to provide all the prejudicial lines with preservative apparatus. The partial experiments have, however, sufficed to prove the efficacy of the process on telegraph lines.

From the combination of these two measures (I mean the improved telephone, and induction overcome), Mr. Van Rysselberghe has derived an unexpected and striking result; for he has succeeded in putting upon the same line, and in causing to operate at the same time, a Morse telegraphic apparatus and a telephone I have seen these apparatus work at the same time, and it is beyond dispute that they do not perceptibly interfere with one another, the double transmission being effected without any difficulty. At the first trial, which took place on the 16th, there were transmitted simultaneously to Brussels two dispatches. The telephone dictated one (which it is unnecessary to reproduce here), while the telegraph was registering another (and entirely different one). These two dispatches were at once sent to their address. It should be remarked that they passed at ten minutes past eight in the morning, that is to say, after the work of the office had been resumed, and when inductive actions were already very energetic. We shall study more at leisure the processes employed by Mr. Van Rysselberghe, but it has seemed to us well to call attention to these beautiful experiments at once after their occurrence.

Manufacture of Chemicals.

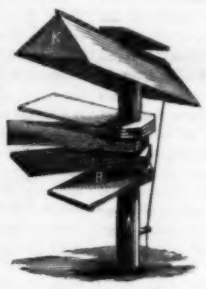
The report of Special Agent Rowland shows that during the census year there were 1,349 establishments engaged in the manufacture of chemicals, with an invested capital of $85,486,856, and giving employment to 29,500 hands, about 1,500 of them women and girls. The wages paid amounted to nearly $12,000,000; the materials used cost $77,344,281, and the total value of the products was $117,407,054.

The more important products were: fertilizers, $19,921,400; soaps, $20,365,599; dry colors, $4,086,821; white lead, $8,770,699; glucose, $4,551,212; sulphuric acid, $3,661,876; stearic acid candles, $2,281,600; nitroglycerine, $1,880,417.

AGRICULTURAL INVENTIONS.

A New Fruit Drying Scaffold.

A novel device for facilitating the drying of fruit in the sun is shown in the accompanying engraving, which is a perspective view of the device as arranged for use. In the engraving, A is a post of suitable height and size, the lower end of which may be either set in the ground or attached to a suitable base to give it necessary stability. In the upper end of the post are formed two longitudinal slots, which intersect each other at right angles, and by the use of proper pins and lugs the ridge pole which supports the roof is united to the post. Attached to the post, A, are shelves, B, made of any convenient length and breadth, and near one end of the shelf is formed a hole to receive and fit upon the post. The shelves are supported at the desired height by projection pins attached to the post below the lowest shelf. To the perforated ends of the shelves are attached short boards, D, to give the shelves longer bearings on the post and also to keep the shelves at such a distance apart that the fruit upon them shall not be disturbed. The roof, K, made of boards or of a frame and covered with canvas, is so arranged at the point of contact of the ridge pole and post that, by pulling down upon a rope, the roof may be raised to an upright position, exposing the fruit upon the scaffold to the full rays of the sun, and may also be turned to a vertical position. The fruit is protected from rain or dew by swinging the shelves together and lowering the roof over them. This invention is patented by William Smith Haley, of Columbia, Tenn.



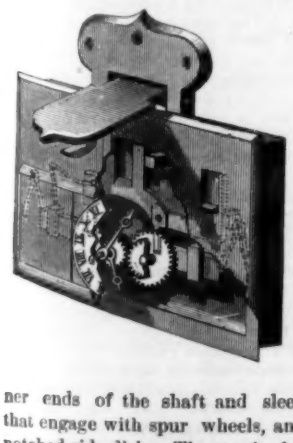
Mowing Machine Seat.

Mr. James Fulton, of Great Bend, N. Y., has patented a useful improvement in mowing machine seats, which will be appreciated by those who are obliged to ride on reapers and mowers. The engraving is a perspective view of the seat, which is so constructed and attached to the seat standard of mowers and reapers, that the sudden lateral motion given to the standard, while passing over rough and uneven ground, will not be communicated to the rider. The seat of the machine is supported upon links suspended from the forked ends of the seat standard and is arranged so as to oscillate freely. In the engraving, A is the seat standard. On the under side of the seat is a support with lateral spring arms which are secured to the links hanging from the standard. The forward part of the seat is connected to the standard by a support which prevents the seat from tipping too far back. With this construction the seat standard is free to move from side to side with the up and down motions of the axle of the machine, without suddenly carrying the weight of the rider with it.

MISCELLANEOUS INVENTIONS.

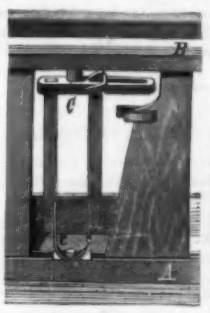
Permutation Trunk Lock.

An improved combination lock, which can only be locked or unlocked by a person acquainted with the combination of the several parts, has been lately patented by Mr. William Rowe, of Biddeford, Me., and is shown in the annexed engraving. The lock casing is provided on its front side with a recess, in which is placed a dial, and also upon the case are two beveled ridges in which a plate slides for covering the face of the dial. This dial is provided with two hands, one of which is mounted on the outer end of a shaft, and the other is mounted on a sleeve that surrounds this shaft. On the inner ends of the shaft and sleeve, pinions are mounted that engage with spur wheels, and on the spur wheels is a notched side disk. These wheels are mounted loosely on pintles and pass through a horizontal slot in the rear wall of the lock case, and project from the inner surface and are rigidly attached to a slide that is pressed toward the dial shaft by a spring, one end of which rests against the slide and the other against the outside of the case. The upper end of the bolt of the lock is provided with a recessed tongue to receive the catch of the hasp, and its lower end has two projecting arms that fit into the recesses of the spur wheels when they are engaged with the pinions of the dial hands. By means of the pintles attached to the slides the spur wheels are drawn back from the pinions of the dial hands, and the lock can be adjusted to be opened at a certain position of the hands on the dial. At all other positions of the hands the lock cannot be opened, and to open it the hands must be returned to their original position. The lock is adjusted from the inside of the trunk.



An Improved Cattle Stanchion.

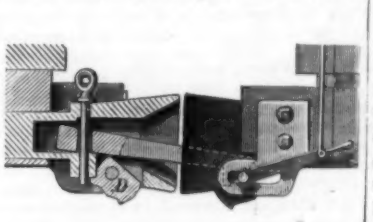
Among recent inventions we find a useful improvement in cattle stanchions, by which both bars of the stanchions are free to move with every motion of the neck and shoulders of the animal, thus adding greatly to the ease and comfort of the animal and obviating altogether the injurious cramping and confinement incident to stanchions of ordinary construction. In the annexed cut, A is the lower, and B the upper beam of the stanchion frame. To and between these beams is pivoted the stanchion, which is formed of a movable stanchion bar that is hinged at its lower end to the curved plate, *e*, and its upper end moves in a slot formed through the long arm of the cross piece, C, and the stanchion bar that is secured at its lower end to the curved plate and its upper end to the short arm of the crosspiece. When the stanchion is open it is kept in proper position by a keeper placed on an upright board, and when the animal is in the stanchion, a hinged bale attached to the plate, C, drops over the upper end of the bar, which is made to reach above the plate for that purpose. This invention is patented by Mr. Stephen J. Adams, of Willett, N. Y.



ENGINEERING INVENTION.

Car Coupling.

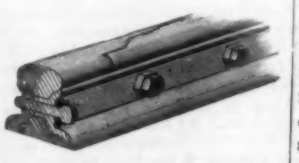
Mr. George F. Bond, of Troy, N. Y., has patented an ingenious automatic coupling for cars that is simple in its construction and efficient in its action. The coupling is shown in the annexed cut. The draw head of a car is provided with an aperture on its under side that contains a swinging cam block, rigidly mounted on a transverse shaft, D, that extends through horizontal slots in guide plates attached to the longitudinal beams of the car frame. This shaft is provided at each end with lever handles, by which it can be rotated and the cam block moved up and down. The block has on its rear end a lug that strikes against the bottom of the draw head when it is swung downward as far as is necessary, and on its front end is a curved ridge which fits into a corresponding groove in the front end of the aperture of the draw head. The coupling bar has an aperture at its inner end through which the coupling pin passes, which also passes through an opening in the draw head behind the cam block. The bar is provided at its outward end with a downwardly projecting beveled head forming a hook. When the cars come together the beveled end of the coupling bar slides up the bottom of the opposite draw head and drops down behind the front end of the aperture in its under side. The head catches on the front end of the aperture and will draw the car. If the cars are to be uncoupled the handle lever is thrown downward and the cam is turned upward into the aperture, raising the end of the coupling bar out of the aperture, and it may then be drawn out of the draw head.



MECHANICAL INVENTIONS.

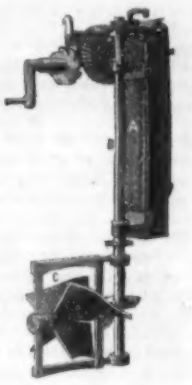
Joint for Railroad Rails.

Mr. James M. Adams, of Stanberry, Mo., has patented a new joint for railroad rails of the class known as "splice" or "lap" joints, and it consists principally in the peculiar manner of scarfing the tread of the rails. The invention is shown in the annexed cut. The faces of the laps are formed with cuts, part of which are diagonal to the line of the rail and part are parallel, the latter being the contact faces of the joint, and are of a length greater than the maximum movement of the rails by expansion or contraction, so that the relative position of the lap will not be changed so as to loosen or tighten the joint. The webs of the rails are cut away where they are brought together, and the edges of the base are chamfered back to allow a hook formed on the lower edge of the fish plate to catch over, and these hooks, being of less width than the length of the mortises cut away, leaves room for the rails to move by expansion and contraction. By this construction of joint all pounding of the car wheels and consequent battering of joints is overcome by the laps of the joint, as the wheels at the time of passing the joints do not pass abruptly from one rail to the other, but at the instant of passing the joint rest upon both rails.



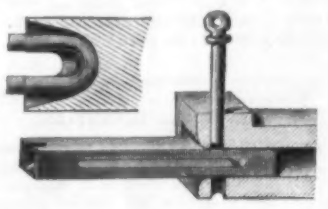
Auxiliary Power Wheel for Ships.

Among recent inventions we find an improved means for obtaining power from the forward motion of a vessel, for operating the pump for pumping water from the vessel, or for other purposes, that is patented by Mr. Kittil Anunsen, of Winchester, Wis. The device is shown in the annexed cut. The operative parts of the device are secured to the vessel by suitable means attached to the bar, A. This bar is provided near its upper end with a fixed bracket, and below this bracket, on a plate attached to the bar, that projects past its sides, is a sliding bracket, and in these brackets is journaled the main vertical shaft, B. This shaft receives motion from the horizontal shaft of the water wheel, C, the motion being imparted by bevel gearing attached to the vertical and horizontal shafts. The water wheel is composed of a horizontal shaft having radial arms, to which are attached sheet metal blades. The shaft of the water wheel is journaled in a rectangular frame having horizontal arms, which latter are perforated, and through which the vertical shaft, B, passes. By this means the water wheel, C, is held in such position that the bevel gearing of the two shafts will mesh with each other, and they are retained in such position by collars secured upon the shaft, B, as shown. The rotary motion which the shaft, B, derives from the water wheel when the vessel is in motion is transmitted by suitable means to a crank shaft, to which the plunger rod of a pump is attached. Devices are provided to raise and lower the water wheel, and the blades of the wheel can be adjusted so as to give greater or less motion, as desired.



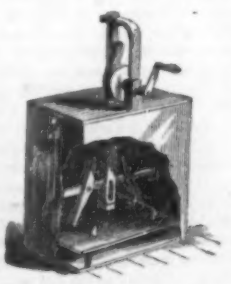
Car Coupling.

Mr. Samuel A. V. Hartwell, of Valley Center, Kan., has patented an improved car coupling, shown in the engraving annexed. The bumper of a car has a rectangular longitudinal perforation, and into this perforation is fitted a sliding bar, in the forward end of which is formed a recess to receive a coupling link. This recess is made flaring to guide the coupling link into its place, and is perforated vertically to receive the coupling pin. In the side of the sliding bar is formed a longitudinal groove to receive the end of a stop pin in the side of the bumper that prevents the bar from being drawn out from it. In use the operator raises the coupling pin and draws out the sliding bar of one bumper, leaving the end of the pin resting on the top of the bar, and then guides with his hand the link of the other car, so that it will enter the recess in the end of the sliding bar. As the cars come together the sliding bar is pushed back into its bumper, leaving the operator ample time to withdraw his hand, so if it is caught it is from gross carelessness. As the bar is pushed back the coupling pin drops through the link and the cars are coupled.



Washing Machine.

Mr. Micajah C. Malone, of Palmyra, Ill., has patented an improved washing machine that is provided with a vertically reciprocating pounder, with which two swinging pounders are combined, so that the clothes will be alternately pressed from above and from the sides. The machine is shown in the annexed cut. A bar passes longitudinally through the washing box and rests on recessed brackets on the inner sides of the ends of the box, to which it is held by pivoted hooks. The lower forked end of the dasher rod is passed over this bar and the lower ends are united by a block, and the rod is prevented from being moved on the bar in the direction of its length by pins and guide slots. Two arms are pivoted to the dasher rod above the bar, and to the free end of these arms swinging levers are pivoted, and these levers are pivoted to the longitudinal bar, as shown, and each has a beveled pounder attached to its lower end. The upper end of the dasher rod is provided with a crank and wheel. When the crank is turned the dasher rod is reciprocated vertically, and the block on its lower end acts to pound the clothes, and its motion also imparts motion to the side levers by which their pounders are alternately separated and brought together.



ENGINEERING INVENTIONS.

A device to prevent nuts of rail bolts from being loosened by continued vibrations has been patented by Mr. Walter B. Johnson, of Waterloo, Ind. A metal strip that will fit between two adjoining nuts is riveted to the outer surface of a washer plate, and is held a short distance from this plate by a small block. The bolts of the nuts to be locked pass through the fish plates and rail, and rubber washers interposed between the washer plate and the fish plate. The ends of the metallic strip are then pressed against the washer plate, and the nuts are firmly screwed on the rail bolts, and the ends of the strip are then drawn outward, so that it will be straightened. If the nuts loosen they will strike against the ends of the strips and the rotation will be prevented.

An improved car coupling has been patented by Mr. Sylvester Oar, of Kansas, Ill. A transverse rock shaft is journaled in boxes on the end of the car, and is provided with collars on the outside of the boxes. The outer ends of the shafts are bent to form handles, and a spiral spring is placed on the rock shaft between one of the boxes, and an arm that projects from the shaft. The projecting arm, when the rock shaft is turned up, engages with a catch on the end of the car. To the under side of this arm is attached a curved arm, and into the slot between the arms projects a pin that is secured to one side of the coupling link that is pivoted on top of drawhead. The outer end of the arm is attached to a rod that passes through an eye secured to the end of the car. Hooks that engage with the outer end of the coupling link are attached to the upper side of the drawboards. By means of the rods and handles at the end of the cars they may be coupled or uncoupled either from their top or sides.

Mr. Charles P. Williams, of Summit Point, W. Va., has patented a new car coupling that is adapted to be operated from either side of the car. The drawhead of the car is of the ordinary construction, and has a cross head, that is formed of two partially closed chambers that communicate with the interior of the drawhead by means of apertures through which a coupling pin passes. This pin has an arrow head at each end, by means of which a catch engages to withdraw the pin from the coupling link. The catch is pivoted to the inner end of a rod that projects through the crosshead. This rod has a spring coiled about it which has sufficient force to hold the catch against the drawhead, and cause the catch which is beveled at the end to be raised through an opening in the top of the crosshead, which opening is so constructed, that when the catch is drawn back it will engage with the neck of the pin. Underneath the crosshead on each side is fulcrumed a lever which is used to lift the coupling bar so that it will properly engage to couple the cars. The coupling bar is of the arrow head form.

Mr. James B. Bray, of Waverly, N. Y., has patented an improvement in car brakes, of that class in which all the brakes of the train are applied from the locomotive by means of a steam piston acting upon buffer rods extending the whole length of the cars, and it consists in running short stiff buffer rods through the trucks at each end of the car, and connecting these short buffer rods directly to the brake beams by springs, then joining the two inner ends of the short buffer rods to form a continuous connection by means of a traction rod running from truck to truck of the car, which traction rod is at each outer end connected to the inner ends of the buffer rods through a lever.

ELECTRICAL INVENTION.

An invention, by which the loss of power resulting from the rapid reciprocating movement in electro-magnetic motors in which the vibration of armatures is utilized for power is avoided, was recently patented by Mr. John Du Bois Kiely, of Toronto, Canada. An endless belt extends around rollers and through the magnets, and has cylindrical armatures attached to it at regular intervals. The armatures are slightly longer than the distance between the magnets, and the space between them is equal to twice their length. The belt rollers are fast on their shafts, one of which carries also a balance wheel. The rollers are flattened on two opposite sides to receive the armatures and to prevent slipping. Each magnet is provided with a circuit closer, consisting of a bell-crank lever, one end of which projects into the path of the armature, so that when pressed down by the advancing armature the lever closes the circuit to the magnet next in advance. This occurs when the armature has passed the point of maximum attraction in one magnet and broken the circuit by its rear end clearing the lever. The armature belt is moved by a draught acting continuously in one direction of the armatures, thus avoiding changes of direction and utilizing the momentum.

MECHANICAL INVENTIONS.

Mr. Rudolf Wittman, of New York city, has patented an improved device for rapidly and accurately measuring dimensions, such as curved and right lines. The dividers have the usual legs. A circular casing attached to the joint piece of the dividers contains a dial whose circumference is divided into any number of parts. This dial is connected by a train of cogwheels of equal size, with a tracing wheel of the same size and number of teeth pivoted to a projection of the casing. One revolution of this wheel corresponds with one revolution of the dial. A cogwheel having one tooth more than the wheels of the train engages with one of these wheels, and is provided with a pointer which passes through the center of the dial and revolves over its face. The casing is also provided with a rigid pointer extending from the middle of the dial to its edge. To measure a curved or right line, the instrument is inverted and the tracing wheel is rolled along the line to be measured, the dimension being given by the pointer on the face of the dial.

A new mechanical movement, designed to convert an oscillating movement into a rotary movement in a single direction, and to take the place of a ratchet and pawl mechanism, has been patented by Mr. James B. Bray, of Waverly, N. Y. A rotary shaft carries a gear wheel between two frame plates. A swinging frame is hung loosely on the shaft and carries a pinion arranged to mesh with the main gear wheel. Upon each side of the swinging plate, on fixed bearings in the frame plates, are loose pinions that mesh with the main gear wheel. When the swinging frame is moved toward one pinion its pinion meshes both with the pinion on the frame plates and with the main gear wheel. All these wheels are locked together, so that when the swinging frame is moved forward it acts as a rigid lever on the shaft to turn it. When the frame is thrown in the opposite direction the direction of the movement of the shaft is reversed.

Mr. Samuel Irwin, of Lindsay, Canada, has patented an improved oarlock, by which the person rowing is enabled to face in the direction the boat is being propelled, thus facilitating the steering. The handle and blade sections of the oar are divided and firmly fixed in sockets formed with toothed segments at their ends that mesh into each other, and are fulcrumed between two plates which are held firmly together. When the handle section of the oar is pulled toward the rower the blade section will move in the same direction and propel the boat forward. To allow the necessary motion to the oar to permit it to enter and leave the water the fulcrum box has trunnions which rest in bearings secured to the gunwale plate of the boat.

AGRICULTURAL INVENTIONS.

Among recent inventions we find a combined sheep rack and trough patented by Mr. Amer R. Yost, of Somerset, O. The base of the rack is of box form, open at the top, and provided with four corner posts. To the corner posts of the sides of the box are pivoted the lower bars of racks, adapted to swing toward or from each other, and the box is covered by a rack bottom that may be revolved to clean out the box. To the end posts of the rack and between their sides is pivoted a swinging end gate that is held from swinging by a pin. By this construction the end racks may be swung up and the rack bottoms removed. To the corner posts are also pivoted arms the outer ends of which are provided with an angular trough for feeding grain to stock, and the racks when swung upward form a wedge-shaped space for the hay, the feeding troughs serving as a support for the rack.

Mr. John Feldmier, of Oskaloosa, Kan., has patented a corn planter of the class in which the dropping mechanism is operated by a knotted wire or rope stretched across the field, and by means of which the rows are properly check-rowed. The machine is supported on two wheels connected by an axle, to which is attached at the inner sides of the wheels two transverse bars. To these bars are pivoted side hoppers, connected by a crossbar attached to runners that open channels to receive the seed which passes from the spouts of the hoppers, and as soil falls back into its place it is pressed down by a wheel. To the center of the machine is attached a tongue, to which are pivoted two parallel bars carrying a central hopper provided with a runner in front and a wheel behind for preparing the soil and covering the seed. A three-armed plate is pivoted at its center to the cross bar, and to one of its arms is pivoted the seed dropping slides of the side hoppers, and to the second arm of the lever is pivoted the dropping slide of the center hopper, so that the seed will be dropped simultaneously from all the hoppers. The third arm of the lever is pivoted to a rod operated by the knotted check rope.

A device that cleans grain of all light impurities by means of friction and the blast of air which results from its passage down a steeply inclined pipe, has been patented by Mr. Sewall Truax, of Walla Walla, Washington Ter. It consists of two or more steeply inclined chutes arranged below each other, and connected by a vertical chamber. The grain passes from a hopper and is distributed over a screen which removes the coarser refuse and falls upon a fine screen. From this screen it is discharged into cups attached to a belt, its weight turning the belt cylinders, on each end of which are ratchets that jar the screens. When discharged from the cups the grain passes rapidly down until it is diverted from its course into an upright pipe by an adjustable slide. The velocity of the grain creates a strong upward blast, which carries with it all light impurities, while the clean grain falls to the bottom and is carried to the receiver.

An improved fanning mill has recently been patented by Mr. Johnathan D. Bash, of Lebanon, Mo. The fanning mill is of ordinary construction in the frame, casing, fans, and fan shaft, with the connecting gear and crank. To the outer end of the fan shaft is attached a crank, the pin of which passes through a longitudinal slot in a horizontal arm of a right angle lever that is pivoted at its bend to a post on the outer surface of the casing. The lower end of the vertical arm of the bent lever is slotted to receive a pin secured to the end of a lever that passes through the casing and extends across the mill and is pivoted to the opposite side. An arm projects from the forward side of this lever which is slotted at its outer end to receive a pin attached to the cross bar of the upper sieve shoe, and by this construction the upper sieves receive a vibratory motion. To the under side of the lever, near its center, is attached the shoe of the lower sieves, so that the shoe will be reciprocated by the vibration of the lever.

An improved mowing machine has been patented by Mr. William M. Webber, of Ravenswood, W. Va. The driving wheels and axle of the mower are of the ordinary construction. A rectangular frame is pivoted to the axle, and to this frame is secured the seat and tongue, and between its sides is an auxiliary rectangular frame that is pivoted at its front end to the axle, and its rear end extends beyond the main frame. A cone pulley fixed to the axle of the driving wheels, and a similar pulley of less diameter, is journaled in the sides of the auxiliary frame, the pulleys being connected by a belt. To the end of the small pulley shaft, opposite the pulley, is attached a universal joint. To arms attached to the main and auxiliary frames are hinged corresponding arms of a swinging frame, to which is attached the cutter bar, and in which is journaled a wheel provided with a serpentine edge upon its periphery. The shaft of this wheel connects with the pulley shaft of the auxiliary frame by the universal joint attached to its pulley shaft. The cutter bar is connected with and receives its motion from the serpentine flange on the wheel of swinging frame.

A device by which uniformity in the distribution of fine fertilizers is secured has been patented by Mr. Charles R. Straughn, of Centreville, Md. Above the axle secured to the frame of a seed drill is the seed box, and immediately in its rear, and separated by a partition, is the fertilizer box. The seed is removed from the seed box by a seed-dropping cylinder, and falls into a tapering spout and passes through the hollow shank of the hoe to the ground. A tapering conductor spout is fastened to the bottom of the seed and fertilizing boxes. In bearings on the ends of the fertilizer box a shaft revolves, to which are attached as many bevel gear wheels as there are drills. This shaft is driven from the axle by a belt. Each gear wheel meshes into a bevel gear attached to the upper end of a shaft, the lower end of which works close to the bottom of the fertilizing box, and attached to it are devices which force the fertilizer into the bottom of the box, and it falls through the openings into the conductor spout, and passes with the seed to the ground through the hollow shank of the hoe.

Mr. Henry A. Robertson, of Haskins, Kan., has patented a cultivator that is easily controlled and adjusted. The axle of the cultivator is arched to form space for an auxiliary frame; at the rear end of the tongue is a short cross bar. From the ends of this cross bar braces extend forward and are secured to the tongue, their rear ends being secured to the arch of the axle at its outer ends. Two inclined bars meet beneath the middle part of the tongue, where they are hinged, and their rear ends extend beyond the axle, and are attached to an arched bar the horizontal end parts of which pass through keepers on the plow beams. This auxiliary frame is suspended under the main frame by means of chains attached to the bars, and which pass up to and over a segmented pulley that is controlled by a latched lever in the reach of the driver, and by which the height of the plows is regulated.

MISCELLANEOUS INVENTIONS.

Mrs. Loretta Brownlow, of East Paw Paw, Ill., has recently patented a simple and convenient means for crushing and straining fruit in making jellies, etc. The device consists of an outer colander made of earthen or other suitable material that is perforated in its sides and bottom, and is straighter in its sides than an ordinary colander, and an inner vessel which is made of the same shape and material as the outer, and has numerous small projections formed upon its outer surface to adapt it to produce a rubbing effect upon the fruit placed in the outer vessel. In the rim of the inner vessel are formed holes to receive the arms of a spider, adapted to be sprung into and out of the holes. To the center of the spider is attached a crank, by which the inner vessel is turned within the outer to crush the fruit and press it through the perforations in the outer vessel. In the opposite sides of the rim of the outer vessel are formed holes to receive the inward projecting points of spring arm tongs, that are provided for holding the vessel stationary when in use. A cover which fits into the mouth of the inner vessel adapts it to be used for a variety of purposes when separate from the outer vessel.

Mr. Anton Besse., of Vienna, Austria, has patented a new apparatus for cleaning grits, grains, etc., thoroughly and in an economical manner. A box is provided at its top with a hopper, into which the grits are poured. The outlet gate of the hopper is opened by the descending grits, but prevents air from passing back into the hopper. From the lower end of the hopper the grain passes down through a series of air spaces and inclined plates, and at each space the lighter parts are blown over, leaving the heaviest grain at the last division, and the different weights pass into different receptacles. The motion of the air which passes through the air spaces is produced by a suction apparatus that is connected with a channel in the rear of the box.

Mr. John H. Doyle, of Hillsborough, O., has patented a device for dilating the lips in operations in the mouth that holds them out of contact with the teeth and gums, without exciting the secretion of saliva or causing pain. It consists of two broad hooks, connected by means of a rubber tape and adjustable clasps. The hooks are made broad at their outer and inner ends, and their edges converge toward the bend, at which point they are made flaring to accommodate the curve of the mouth and prevent cutting. The inner end of the hook has a slightly concavo-convex surface, and is provided with a reflector, which is set in the concave side.

An improved locking bolt for railroad rails has been patented by Mr. Thomas J. Bush, of Lexington, Ky. Bolts are bent in such a manner as to form short vertical necks on long diagonal arms, and the long arms are notched on one side near their lower ends. The short parts are formed with screw threads to receive nuts. In securing rails with the locking bolts the cross tie is first bored diagonally in such a manner that the holes will intersect each other at the proper depth. The bolts are then inserted in the holes, the notches on their sides intersecting each other, the nuts applied to the bolts and screwed firmly down to the flanges of the rail, the lower ends being securely locked together within the cross tie.

A sectional impression cup capable of closing to diminish its width, and which can be readily taken apart when desired, has been patented by Mr. James V. McMann, of Waverly, Ohio. The cup is divided through the center of the handle, forming two sections, one of which has a lip fitting into a recess in the other, and secured by a screw, and the recess is made large enough to allow the lip to oscillate slightly therein when the sides of the cup are compressed together. With this construction the cup may be more readily inserted into the mouth of the patient than cups of ordinary construction.

An invention for rapidly and cheaply manufacturing nails for securing wires to fence posts has been patented by Mr. Charles W. Dean, of South Wareham, Mass. The nail blank is cut in one piece from a band of metal in such a manner that both ends of the blanks are pointed without further cutting. As the blanks are detached they form hook-headed nails with sharp pointed ends, and when the points of the heads are bent so that their outer edges are parallel with the inner edge of the body the nail is complete.

Mr. John Cochran, Jr., of Millwood, Mo., has patented an improvement in churns. The body of the churn is cylindrical in form and has a shoulder near its upper end to receive and support the cover. The cover is made in two unequal parts, the smaller part being loose. The larger part is held to its place by buttons that take under cross grooves in the churn body. To this part of the cover is secured a casing that contains and supports the driving gearing. The casing has an outwardly projecting arm, in which a shaft revolves, to one end of which is attached a crank; on the other end is a large bevel gear wheel, the lower part of which meshes with a small bevel gear wheel upon a hollow shaft that revolves in a bearing on the churn cover. In the hollow shaft revolves another shaft having a small bevel gear that meshes with the gear of the driving shaft. To the lower ends of the hollow and solid shafts are attached cross bars to which are secured paddles. When the churn is filled and the handle turned the cross bars and their paddles move in opposite directions and the cream is rapidly agitated.

An improved shaving mug has been patented by Mr. Peter H. Leonard, of New York city. The invention consists in a shaving mug having a soap compartment provided with a spout projecting from the vertical partition of this compartment. This spout is beveled from the upper edge of the partition, whereby when the cup is slightly inclined the surplus water can flow from the soap compartment into the lower part of the mug.

Mr. John Myers, of Philadelphia, Pa., has patented an improved washboard, the frame of which is of the usual construction, except the top and bottom cross-pieces, which are provided with bearings for pivots of vertical sections. The vertical sections consist of wooden slats covered with corrugated metal, and pivoted at their ends, upon which they are made to oscillate. These sections are provided with a lateral opening and are strung upon a rubber band, which passes through the openings and is secured to the side frame of the board so as to yieldingly support the slats in one and the same plane. The washboard being open on both sides, and both sides of the sections corrugated, it may be used on either side, and will last twice as long as a board that is not reversible.

An improvement in umbrellas, parasols, etc., has been patented by Mr. Joseph Forster, of Vienna, Austria. The umbrella is provided with a support formed of four rods, the upper ends of the upper rods being pivoted to the plate of the umbrella; the lower ends of the lower rods are pivoted to each other at the handle, the adjacent ends of the upper and lower rods being pivoted to each other. To hold the supporting frame when the umbrella is raised the upper rods are united by a brace having one end pivoted to one of the rods and the other pivoted to a sliding sleeve on the opposite rod, the sleeve being held by a latch lever. When the umbrella is opened the rods bend outward at their joints and form an irregular lozenge shaped opening, into which the head and hat of the person carrying the umbrella can pass.

A heater for dwellings that provides pure air and is easily controlled has been patented by Mr. James H. Mackintosh, of Paterson, N. J. Around the upper and lower ends of the heater case are formed flanges, which are perforated to receive bolts that secure the case to the top and bottom plates, in which are formed holes to receive the ends of air heating tubes that are fitted air and water tight in the plates. In the opposite sides of the case are openings to receive the inlet and outlet pipes, through which hot water or steam is introduced into the space around the flues to heat the air passing through them. Air to be heated is introduced into the space below the bottom plate through a flue leading from the outside of the building.

An improved clamp for controlling the extension of gas fixtures has recently been patented by Mr. John F. Brown, of Brooklyn, N. Y. A circular case, apertured for the slide rods, has a screw collar for attachment to the fixture. In this case is an arrangement of disks and springs, and a spirally ribbed rod passing through the case and through apertures in the disks is checked in its movement by springs of such strength that their friction on the case holds the weight of the drop-light.

One of the recently patented novelties is a steam heated sadiron, invented by Mr. John M. Edmunds, of Salt Lake City, Utah Ter. The sadiron is composed of a lower chamber, the bottom of which is the smoothing surface of the iron, and an upper chamber connected with the lower by tubes extending almost to the top of the same, so that only steam can escape to the chamber below. This upper chamber has a screw-capped vent for pouring in water, and has also a safety valve. A hollow handle with solid shanks is secured to the top of the upper chamber, and has a vent for admitting oil. A tube provided with a regulating cock is screwed to the handle, and passes down to a lamp in the top of the lower chamber. The wick is ignited and heats the water in the upper chamber, converting it to steam, which passes through the connecting tubes into the lower chamber and heats the same.

A coffee and nut roaster that permits of convenient examination of its contents has been patented by Mr. Thomas F. McCaffrey, of Philadelphia, Pa. The roaster is constructed in two cylindrical sections that are hinged to each other at their open ends. The edge of one section fits into the end of the other, and a hasp is provided for locking the sections together. Each section has a series of apertures for the entrance and exit of air, and a rod projects from their closed ends, on which the cylinder is rotated. Strips project from the inner surface to stir the contents of the cylinder when it is rotated, so that they will not become burned.

A light, durable, and inexpensive horse collar, the body of which is made of paper and hollow, has recently been patented by Mr. Christopher G. Cale, of Albany, N. Y. The body of the collar is made of two sections, which are moulded from *papier maché* or paper pulp, mixed with some glutinous material. These parts are formed in a mould over a core built up of separate sections that are adapted to be drawn one by one from the ends of the body parts of the collar after the pulp has become fixed. The shells of the collar are stopped with plugs, and to these plugs are secured hinges that unite the parts of the collar at its lower end. To the plugs in the upper ends are secured loops and slots that are adapted to be engaged with and retained by each other when the upper ends of the collar are brought together.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Wanted—Parties to introduce the best Type Setting and Distributing Machine ever invented. J. J. Green, Boonton, N. J. Box 415.

The time-worn joke on the steel pen manufacturer, that he makes people steal (steel) pens and says they do right (write), is true of Esterbrook, whose pens are found everywhere.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 28.

Wanted—A good second-hand Dynamo-electric Machine, etc., for plating. Alliance Dash Rail Co., Alliance, O.

Automatic Planer, Knife Grinders, best Solid Emery Wheels, Machines to run Emery Belts, etc. All warranted satisfactory. Amer. Twist Drill Co., Meredith, N. H.

See Bentel, Margedant & Co.'s adv., page 28.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Diamond Engineer, J. Dickinson, 64 Nassau St., N.Y.

The Berryman Feed Water Heater and Purifier and Feed Pump. I. B. Davis' Patent. See illus. adv., p. 29.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 28.

Bostwick's Giant Riding Saw Machine, adv., page 28.

Gould & Eberhardt's Machinists' Tools. See adv., p. 30.

Centrifugal Pumps, 100 to 35,000 gals. per min. See p. 29.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 28.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 29.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 29.

Vertical Engines, varied capacity. See adv., p. 28.

Drop Hammers, Power Shears, Punching Presses, Die Sinkers. The Pratt & Whitney Co., Hartford, Conn.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

4 to 40 H. P. Steam Engines. See adv. p. 28.

Pure Water furnished Cities, Paper Mills, Laundries, Steam Boilers, etc., by the Multifold System of the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Red Jacket Adjustable Force Pump. See adv., p. 13.

Cope & Maxwell M'f'g Co.'s Pump adv., page 13.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 14.

Supplee Steam Engine. See adv. p. 13.

Lightning Screw Plates, Labor-saving Tools. p. 402.

Malleable and *Fine* Gray Iron Castings to order, by Capital City Malleable Iron Co., Albany, N. Y.

New Engine Lathes for sale, for instant shipment; 18 and 20 in. swing; 6 to 16 ft. bed; modern improvements. Forsaith & Co., Manchester, N. H., or 209 Center St., N.Y.

Drop Forgings. Billings & Spencer Co. See adv., p. 405.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 405.

The Sweetland Chuck. See illus. adv., p. 406.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor, Stiles & Co., Riegelsville, N.J.

Electric Lights.—Thomson Houston System of the Arc type. Estimates given and contracts made. 631 Arch, Phil.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester, N.H.

List 28, describing 3,000 new and second-hand Machines, now ready for distribution. Send stamp for same. S.C. Forsaith & Co., Manchester, N.H., and N.Y. city.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Small articles in sheet or cast brass made on contract. Send models for estimates to H. C. Goodrich, 66 to 72 Ogden Place, Chicago, Ill.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3063, New York city.

Improved Skinner Portable Engines. Erie, Pa.

Jas. P. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users & engineers. (Forward above by postal or letter; mention this paper.)

Steel Stamps and Pattern Letters. The best made. J. F. W. Dorman, 21 German St., Baltimore. Catalogue free.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 129 Center St., N. Y.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N.J.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

NEW BOOKS AND PUBLICATIONS.

ANNUAL REPORT OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION, 1880. Washington: Government Printing Office. 8vo, pp. 772.

One of the fullest and most valuable of the reports of this institution, now the center of much of the best scientific work of the country. The funds of the institution amount to $651,500. Professor Baird believes that the efficiency of the institution would be doubled were its endowment raised to the limit fixed by Congress, $1,000,000. It is doubtful if $348,500 could be placed where it could do more for the increase and diffusion of knowledge among men. A valuable feature of this year's report is a 200 page summary of recent scientific progress. Among the other useful papers is a 100 page synopsis of the writings of Sir William Herschel.

GEOLOGICAL SKETCHES AT HOME AND ABROAD. By Archibald Geikie, Director General of the Geological Surveys of the United Kingdom. New York: Macmillan & Co.

Dr. Geikie is a charming writer as well as a successful student of geology in its broader aspects. The papers here collected cover a wide range of subjects, from the author's first geological excursion as a boy to his recent studies of American geology in Utah, Wyoming, and Colorado. The volcanoes of central France, the old glaciers of Norway and Scotland, geographical evolution, and the geological influences which have affected the course of British history, are among the other subjects treated upon.

REPORT OF THE CHIEF OF ORDNANCE TO THE SECRETARY OF WAR FOR 1881. Washington: Government Printing Office. 8vo, pp. 560.

In addition to the usual statement of the principal operations of the Ordnance Department for the year covered, the volume contains thirty-eight papers on ordnance and other subjects, some of which, like the report on files by Lieutenant Lyle and Master Armorer Porter, are of general interest to mechanics and engineers.

ANNUAL REPORT OF THE OPERATIONS OF THE UNITED STATES LIFE SAVING SERVICE FOR 1881. Washington: Government Printing Office.

One hundred and eighty-three stations were maintained, 143 on the Atlantic coast, 34 on the Lakes, and 6 on the Pacific. There were within the scope of the operations of the service during the year 250 disasters to vessels, carrying 1,878 persons, of whom 1,854 were saved. Sixteen other persons not on vessels were saved from drowning. Threatened disaster to 188 vessels, stranded or otherwise imperiled, was averted by the service. Sixty-six vessels were a total loss. Property to the value of nearly three million dollars was saved by the service.

CALIFORNIA AS IT IS. Written by seventy leading editors and authors of the Golden State. San Francisco *Call* Company. 8vo, pp. 209. Cloth, 75 cents.

Any one wanting specific information with regard to the natural characteristics, the people, or the industries and resources of any part of California will find it here. The book is packed with facts and statistics, each county being described in detail by one or more of the editors residing in it.

THE THEORY AND PRACTICE OF THE PREPARATION OF MALT AND THE FABRICATION OF BEER. Translated from the German of Professor Julius E. Thausing, by William T. Brannt, and Edited by A. Swartz and Dr. A. H. Bauer, of the *American Brewer*. Philadelphia: Henry Carey Baird & Co. 8vo, cloth, pp. 810.

This adaptation of the admirable work of Professor Thausing to the conditions and requirements of American brewing and brewers has been done with ability and care. It is now rather a brewer's encyclopedia than a simple treatise on brewing. In addition to the purely technical matter the volume contains elaborate chapters on the physics and chemistry involved in or incidental to scientific brewing; the production and testing of the materials used; the apparatus and machinery employed by brewers; statistics of brewing; artificial refrigeration; the examination and testing of beer; the metric system; and no end of commercial, agricultural, and other information bearing on the great and rapidly growing brewing industry.

THE COUES CHECK LIST OF NORTH AMERICAN BIRDS. Second edition. With a Dictionary of the Etymology, Orthography, and Orthoepy of the Scientific Names, etc. Boston: Estes & Laurint.

This is quite a different book from the original check list, the high value of which as a catalogue of names is known to all students of American ornithology. The present volume is an improvement and extension of that, with an ornithological dictionary added. As an indication of progress in this department of science, it may be noted that the number of species is now 888 against 778 as given in 1874, while ten of the latter list have been ruled out—six as synonyms and four as extra limital. Thus 120 new species have been discovered in eight years.

ANDREW J. CORCORAN'S SYSTEM OF WATER SUPPLY. Office, No. 76 John Street, New York.

A very handsome illustrated catalogue of Mr. Corcoran's windmills, pumps, and other water supply material. A large number of full page engravings show windmills of artistic designs erected at country seats.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) C. W. C. writes: Having collected a great number of small pieces of various kinds of soap which have been saved in the household after having become too small to use, I wish to inquire how I can combine the same so as to make into one cake. I have grated and heated to a thick consistency in a pail immersed in boiling water, but it will not harden when cold. A. Heat the mass in a copper kettle with constant stirring until it becomes pasty, then pour out in a wooden box, and let the mass cool thoroughly before cutting.

(2) J. N. C. writes: I have had a carving, in pure white marble, made of my daughter and placed at the head of her grave, a good likeness of her, life size, and an exquisite piece of carving, pronounced equal to any existing. To protect it from the weather and injury of every kind, I had a glass case made of heavy French plate glass, about 2 feet square horizontally and 5 feet high, placed over it and resting upon the square stone base on which the figure is placed. This case has a solid bronze frame, and the glass is cemented in, water and air tight, and air and water tight around the base; neither air nor moisture can get in from the outside, and yet the top of the case, which is also glass, is studded thickly with large drops of water, which are every now and then dropping down on to the marble figure and producing mildew. Frequently all four of the glass sides will be covered with moisture like steam, almost hiding the inside from view. The point is, to remedy this accumulation of moisture. Can you help us? A. The moisture is doubtless derived by precipitation from the air inclosed in the glass case. A simple remedy is to put in the case a tray containing a pound or two of powdered quicklime to absorb the moisture. The case should then be sealed.

(3) G. L. K. asks: Can you give a receipt for a good black (when first written with) ink? A. A very good black ink is prepared by dissolving best soluble nigrosine in hot water, in the proportion of about 2½ ounces to the pint.

(4) D. C. W. writes: In SCIENTIFIC AMERICAN SUPPLEMENT, No. 236, page 3600, you have an article written on salicylic acid. Now what I should like to ask of you is, whether salicylic acid is the thing to stop fermentation of mince meat, and about how much to use per 100 pounds? Also, how will it act on sweet cider, or will it stop ferment in it? A. Salicylic acid has been used for this purpose; 10 grains per quart will ordinarily preserve mince meat. Bisulphite of soda is better for cider. See "A New Antiseptic," page 5293, SUPPLEMENT, No. 332.

(5) E. K. asks: 1. Could I beg you to inform me how artificial stone is made, such as are used for fences, etc.? They are almost as hard as granite, and stand the weather. A. The stone you refer to is made from sand, ground slate, hydraulic cement, and water. These are mixed together with water and moulded under pressure. 2. What is the chemical name for waterglass? A. Waterglass is also called soluble glass and silicate of soda.

(6) M. W. asks: Please advise me how to make a hard rubber solution that is used for coating saddlery hardware. Can it be applied to brass and other metals? A. We know of no good solvent for hard rubber or vulcanite. It cannot be used in the way you propose. Try fine black japan varnish.

(7) J. A. McC. asks: Can you inform me what kind of wax or preparation copper plate engravers use for etching? Refer me to some book describing the same. A. See "Etching and Engraving," Spons' "Workshop Receipts."

(8) J. C. asks: Can you inform of a solution to flow on surface of engraver's boxwood, preparing it for a silver print or photograph to engrave from? I desire some method to make a print from photograph to engraver's wood. If paint is not very clear it will answer my purpose for engraving. A. See "Photographs on Wood for Engraving," by Edward Pocock, in SUPPLEMENT, No. 53.

(9) W. H. D. asks: Can you tell me how to keep bright steel goods from rusting without impairing the bright finish? Don't want to paint the article. A. The rusting is due to the precipitation of moisture from the air. It may be obviated by keeping the air surrounding the goods dry. A saucer of powdered quicklime placed in an ordinary show case will usually suffice to prevent rusting of cutlery on exhibit therein.

(10) A. E. Des B. asks how to run a type metal plate in a plaster of Paris mould for engraving purposes, without its filling full of air or steam holes, and not at all corresponding with the smooth surface of the plaster mould. As I pour the melted metal into the mould, it bubbles and boils like boiling water, finally cooling and hardening, full of cavities, etc., on the under side where intended for engraving. A. Warm the plaster mould, secure it, face upward, in a shallow cast iron pan, and plunge, pan and all, into a pot of melted type metal until bubbles of air and steam are no longer given off. Then draw out, cool, separate the plate, and plane or trim it.

(11) H. H. asks: Can you tell me of a way in which to destroy or drive away ants? I am troubled with them more this year than ever before, they destroying the lawns, flower beds, and paths. A. The judicious use of a little cheap benzine will usually destroy or exterminate the pest without materially injuring vegetation or endangering the lives of animals.

(12) S. K. W. writes: I desire to know if there are any manufacturers of sulphate of ammonia and vitriol in the States? Also the price of these substances wholesale? Is gas water utilized in any way, or is it allowed to run into the rivers, etc., as waste? A. Sulphate of ammonia and oil of vitriol (sulphuric acid) are both largely manufactured in the United States. For prices address any of our operative or manufacturing chemists. Very little of the first wash water in gas manufacturing is allowed to waste, as they usually contain much condensable hydrocarbon matters, ammonia salt, etc., which can be profitably extracted therefrom.

(13) M. H. S. writes: I have a good deal of trouble in the foundry I am engaged with, in getting the copper and zinc we use occasionally to give good results, and apply to you for aid and information. The copper is what is called battery copper, and the zinc is the same, battery zinc. Will you please inform me the best method of obtaining good results from its use? What chemicals can be used with the copper in making a brass mixture that will make a good, solid, smooth casting? We used this copper once in making a very large brass casting, and when pouring a white vapor issued from the mould and filled the whole room. What was the cause of it? What is the best method of refining the zinc? A. Battery copper usually contains a little zinc and zinc and copper sulphates. When the copper is melted, the salts and some of the zinc volatilize, producing the fumes mentioned. In melting use a little carbonate of soda, skimming the dross well before pouring. The addition of one-tenth of one per cent of phosphorus to the copper alloy will improve the castings. The zinc can only be purified by redistillation. See Percy's "Metallurgy—Zinc."

(14) B. B. P. asks: Is there anything that will remove the peculiar smell of benzine without interfering with its cleansing properties? A. If fractionally redistilled by injection of superheated steam, so as to prevent "cracking," a benzine nearly free from the grosser odor observed in the crude distillate may be obtained. It is, however, impossible to competely deodorize benzine.

(15) T. H. S. asks: Can you inform me of any process to bleach asphaltum white? A. No; asphaltum cannot be bleached.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

June 20, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 361 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Advertising card, C. M. Finch 259,838
Air compressing apparatus, hydraulic, J. M. Bois 259,709
Air compressor, J. H. Baker 259,741
Automatic sprinkler, C. W. Talcott 259 780
Axes, machine for making, H. Daufen 259,824
Axle box, car, L. H. Tourville 259,948
Ball and socket joint, O. C. White 259,957
Barber's chair, E. Berninghaus 259,600
Barrels and packages, apparatus for registering the size and number of, G. W. Wundram 259,739
Bed bottom, spring, W. Bulkeley 259,810
Belting, manufacturing rubber coated, J. W. Gray 259,830
Binder, temporary, A. L. Pratt 259,915
Board. See Game board.
Boat. See Tow boat.
Boilers, apparatus for removing scale, sediment, etc., from, T. J. Jones 259,698
Book, copying, C. D. Campbell 259,975
Book support, M. W. Filley et al 259,857
Boot and shoe heels, machine for securing, F. Richardson 259,720
Boot treeing apparatus, J. H. Burbank 259,811
Boring cylinders, tool for, J. N. Smith 259,727
Bottle cover, mustard, M. Ams 259,740
Bottle stopping apparatus, P. J. Carmien 259,815
Box. See Axle box.
Brick mould, T. McNicholas 259,909
Brush, dusting, M. S. W. Brown 259,807
Buckle, trace, M. E. Zeller 259,970
Buckwheat hulling and separating machine, W. A. Cowley 259,670
Burglar alarms, electrical connection for, J. A. Davis 259,825
Burial cases, shipping box for, G. W. Dow 259,981
Burner. See Lamp burner.
Butter, cooling, W. S. Osborn 259,907
Butter, etc., cooling and refrigerating, W. Tunstill 259,782
Button, F. S. Harrington 259,805
Button, separable, A. H. Alderman 259,972
Can. See Sheet metal can. Swinging can.
Can covers, securing, E. Bottenberg 259,800

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Car coupling, L. Anderson 259,978
Car coupling, J. Barrett 259,792
Car coupling, R. M. Brooks 259,804
Car coupling, S. C. Collins 259,821
Car coupling D. France 259,841
Car coupling, W. Powers 259,914
Car coupling, Wilson & Simpson 259,960
Car coupling, C. W. Rasmusen 259,719
Car coupling link, J. T. Wilson 259,959
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Car switching system, street, T. B. Estep 259,675
Car ventilating apparatus, railway, Stephan & Gleriet 259,938
Car wheels and axles, tool for dressing, J. N. Smith 259,728
Carburetor, air, G. Resnor 259,921
Carpet exhibitor, A. Peterson 259,713
Carpet or oil cloth fastener, E. E. Johnson 259,864
Carpet sweeper, J. Hinkley 259,956
Carpet sweeper, H. A. Mueller 259,901
Carriage bows, side piece for, F. A. Wittich 259,785
Carrier. See Egg carrier. Trace carrier.
Case. See Chain show case. Metallic case.
Celluloid, cellulose, etc., moulded boat and other articles from, M. F. Davis 259,826
Chain show case, watch, E. A. Bliss 259,742
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Chair and crib combined, Welsh & Trudell 259,953
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Clock, T. Hollander 259,638
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Cultivator, B. A. Taber 259,943
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Decorating or producing designs on the surfaces of earthenware tiles, etc., E. Lee 259,876
Dish butter, W. J. Miller *et al* 259,988
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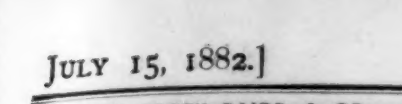

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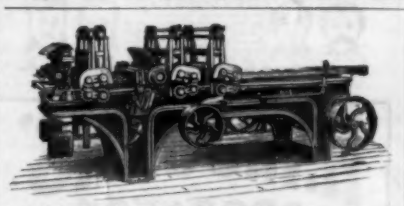

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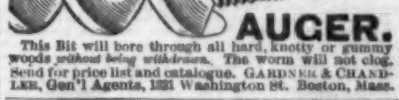

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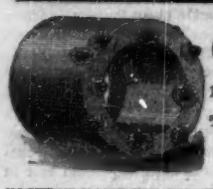

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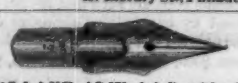

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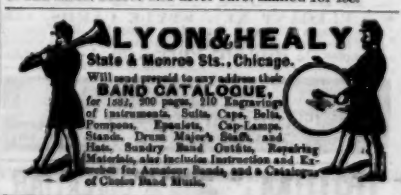
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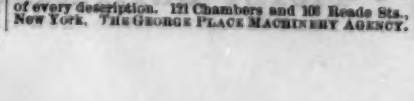

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